Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

In this issue—

APR 22 1953
LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

— Cold Storage Life of Rockfish, p.1
— Impulse Extraction of Oils, p.5
— Modern Methods of Fish Detection, p.7
— Heating in Fish Meal, p.9
— Stability of Antioxidants in Fish, p.17
— and 34 others

Vol.6 No.4 April 1953

Fish and Wildlife Service
U.S. Department of the Interior
Washington D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR

DOUGLAS McKAY, Secretary

FISH AND WILDLIFE SERVICE

ALBERT M. DAY, Director

Commercial Fisheries Abstracts

Prepared in the Branch of Commercial Fisheries

EDITORS

A. W. ANDERSON, Chief, Branch of Commercial Fisheries

Wm. H. DUMONT, Chief, Educational and Market Development Section

ASSOCIATE EDITOR

MAURICE E. STANSBY, Chief, Pacific Coast and Alaska Technological Research

ASSISTANT EDITOR

ROY C. STEVENS, Fishery Products Technologist, Seattle

Applications for COMMERCIAL FISHERIES ABSTRACTS, which is mailed free to members of the fishery industries and allied interests, should be addressed to the Director, Fish and Wildlife Service, United States Department of the Interior, Washington, 25, D.C.

Fulfillment of foreign requests confined to Government agencies, research institutions, and libraries.

The Service assumes no responsibility for the accuracy of material from outside sources, and can fulfill requests for copies of the articles only if the abstract was taken from a Service publication. Readers should direct requests for other articles to the author of the article or to the publication in which it appeared. The addresses of these publications are available from the Fish and Wildlife Service, Washington 25, D. C., and will be sent to inquirers upon request.

The abstracts in this leaflet may be left in their present form; but it is suggested that to make the most efficient use of them, they be cut out on the lines designated and filed by the number in the upper left-hand corner of each. For a full description of this filing system see "Fishery Technological Abstract Card System" by Maurice E. Stansby and K. L. Osterhaug, Fishery Leaflet No. 232, obtainable free by request from Fish and Wildlife Service, Washington 25, D. C.

In addition to the regular abstracts, there is included a bibliography of references of secondary importance (without abstracts). These may be cut off on the lines designated and pasted on standard 3 x 5-inch cards for filing.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical
1 Fish by species
2 Fresh fish
3 Preserved fish
4 Oils
5 Vitamins
6 Fishery by-products
7 Analytical Methods
8 Composition
9 Miscellaneous

Issued with the approval of the Bureau of the Budget, December 29, 1950

3.249 FREEZING AND COLD STORAGE OF PACIFIC NORTHWEST FISH AND SHELLFISH. I. STORAGE LIFE OF VARIOUS SPECIES OF ROCKFISH FILLETS

Miyauchi, D. T. and Stansby, M. E. (Seattle Fishery Technological Laboratory)
Commercial Fisheries Review 14, No. 12A, 24-28 (December, 1952 Supplement)

Sample	Species of Rockfish: Scientific name	Species of Rockfish: Common name	General Description	Source of Sample	Number of fillets per 1-pound package
A	Sebastodes alutus	Pacific ocean perch	Color: bright carmine red on dorsal surface; lighter on ventral surface with some silvery. Length to 19 inches.	Newport, Oregon	4 to 5
B	Sebastodes diploproa	Lobe-jawed rockfish	Color: rose red to brick red on dorsal surface; silvery on ventral surface. Length to 12 inches.	Newport, Oregon	4 to 5
C	Sebastodes paucispinis	Bocaccio	Color: light green to dark brown on dorsal surface; shading into reddish bronze to white on ventral surface. Length to 3 feet.	Eureka, California	3 to 5
D	Sebastodes goodei	Chilipepper	Color: pinkish red on dorsal surface; shading into pink on ventral surface. Length to 22 inches.	Eureka, California	4 to 5

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. VI NO. 4 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Reprinted in part

3.249 FREEZING AND COLD STORAGE OF PACIFIC NORTHWEST FISH AND SHELLFISH. I. STORAGE LIFE OF VARIOUS SPECIES OF ROCKFISH FILLETS (Cont. from Card 1)

Sample	Quality of Fillets 2/: Initial Acceptability and rating	Rating after storage at 0° F. for: 9-12 weeks	13-16 weeks	17-20 weeks	21-24 weeks	25-28 weeks	29-32 weeks
A	VG	G	M	M	M-F	F	U
B	G	M	M	M-F	-	U	
C	VG	G	M	M	F	F	U
D	VG	M	F	F	U		

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. VI NO. 4 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Reprinted in part

3.33 ROCK LOBSTER CANNING

le Roux, G. J. and v. d. Merwe, R. P.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952) 10-13

The precook prior to canning rock lobster meat results in a substantial loss of weight. An attempt was made to determine the extent of these losses and the relative amounts lost from body and tail.

By weighing a group of tails before and after a precook of 12 minutes at 220°F. the losses were found to vary between 10 and 20 percent, averaging 15.5 percent. No relationship was found between size of fish and percentage loss during the cook.

After cooking a group of whole rock lobsters the tails were removed and weighed. The tail weights with shell averaged 34 percent of the total, varying from 30 to 37 percent. The tails of the smaller fish were slightly heavier in proportion to total weight than those of the larger ones.

Taking an average figure of 30 percent for the shell weight in relation to tail weight, the tail flesh averaged about 24 percent of the weight of the cooked fish.

The importance of freshness was demonstrated by dividing a group of live rock lobsters in two, processing one batch immediately and allowing the other to die and be held for 48 hours before processing.

Cans of each batch were examined 3 weeks and 3 months after canning. Although there was only a slight amount of difference in color between the two batches -- the "fresh" canned being slightly lighter than the "stale" canned -- the peculiar "dull" odor which often develops on storage of canned rock lobster was more pronounced in the cans of "stale" fish than in the cans of "fresh".

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. VI NO. 4 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Kathryn L. Osterhaug

COLD STORAGE LIFE OF ROCKFISH

CANNING ROCK LOBSTERS

3.238 FREEZING OF ROCK LOBSTER

v. d. Merwe, R. P. and le Roux, G. J.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952) 10

Tails from fresh rock lobster were weighed and then wrapped in cellophane using three variations. After storage at +5°F. for 1 year the tails were thawed, unwrapped, and reweighed.

The percentage weight losses, based on the original weights of the tails, were as follows:

(1) Tails half wrapped in 300 P.T. cellophane -- 9.3%.
(2) Tails half wrapped in 300 MSAT cellophane -- 8.2%.
(3) Tails completely wrapped in 300 MSAT cellophane -- 3.9%.

The butt ends of the lobster tails wrapped in 300 P.T. cellophane showed distinct signs of dehydration; those half wrapped with 300 MSAT cellophane showed slight evidence of dehydration; and those completely wrapped in 300 MSAT cellophane showed no evidence of dehydration.

All of the samples had deteriorated in quality during storage. This was attributed to the long storage time at a relatively high temperature.

Whole rock lobsters were divided into two lots, one of which was frozen raw while the other was cooked at 220°F. for 10 minutes before being frozen. Both lots were stored at -5°F. for 9 months.

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. VI NO. 4 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Kathryn L. Osterhaug

COLD STORAGE LIFE OF ROCKFISH

FREEZING OF ROCK LOBSTERS

3.33 (Cross Reference: 1.87)

It was determined that if frozen storage of lobster tails is necessary prior to canning, a lighter colored product will result from "frozen cooked" than from "frozen raw" fish.

An experiment was performed to determine whether bleeding the lobsters before processing would prevent blue and brown discoloration. The results of this investigation were negative.

In order to determine the effect of the temperature of the water used for leaching the lobster flesh prior to canning, individual tails were cut into sections and leached in sea water for 15 minutes at different temperatures and then canned. Leaching at 60°F. and at 120°F. resulted in canned products of normal color, but those leached at 212°F. were darker than the others.

The addition of 1/2 percent sodium hexametaphosphate to rock lobster tails prevented the formation of struvite crystals in the canned product. Leaching of the flesh in acidified water and then adjusting the pH to 7.0 tended to prevent the formation of the crystals. Further work is needed on this project. Leaching with sea water from which the magnesium had been removed also had a tendency to reduce struvite formation.

Tests were made to check statements to the effect that struvite had not been found to form when the tails were packed in glass jars. After 10 days' storage at room temperature struvite crystals could already be seen to have formed in the flesh in the glass jars. Inspection after 2 and 10 months' storage indicated equal amounts of crystals had formed in both the glass jars and the metal cans. The "dull" odor was also found to develop equally in both types of container.

The times required to cool the center of 8-ounce rock lobster cans from 200°F. to 100° F. with the cooling medium at 75°F. were found to be as follows: (a) in a "steady flow" of water - 27 minutes, (b) in "still air" - 2 1/2 hours, (c) in an air blast of 400 feet per minute - 45 minutes.

From these cooling rates, a tunnel with a production capacity of 1,200 cases of 8-ounce rock lobster cans per 10-hour day (and able to handle a production peak of 180 cases per hour) would be approximately 12 feet in effective length, 5 feet 3 inches high and 3 feet 9 inches wide and would contain 4 trolleys. Each trolley would hold 12 trays of 4 cases each. Allowing an average air temperature rise of 30°F., the air required would be 14,500 c.f.m. This could be provided, for instance, by a 48-inch axial flow fan drawing 0.67 h.p.

3.238 (Cross References: 3.249, 1.87)

Preparatory to the examination the raw tails were thawed and cooked and the cooked tails thawed and heated. The whole fish were cut in half in a dorsal-ventral direction, and the flesh of both bodies and tails examined.

The flavor of the flesh of both groups was equally good but the flesh of the frozen cooked tails was rather tough and stringy. No sticking of the tail or body flesh to the shell was observed in either lot.

3.249 (Cross Reference: 1.4)

Sample	Species of Rockfish: Scientific name	Species of Rockfish: Common name	General Description	Source of Sample	Number of fillets per 1-pound package
E	Sebastodes pinniger	Orange or red rockfish	Color: light olive gray with orange red, red predominating, on dorsal surface; paler to nearly white on ventral surface. Length to 2½ feet.	Seattle, Washington	2 to 3
F	Sebastodes ruberrimus	Red rockfish or "red snapper"	Color: deep vermilion red on dorsal surface; paler on ventral surface. Length to 3 feet.	Seattle, Washington 1/	1 to 2
G	Sebastodes miniatus	Vermilion rockfish	Color: vermilion red on dorsal surface; light red on ventral surface; black dots on back and sides. Length to 3 feet.	Seattle, Washington 1/	1 to 2
H	Sebastolobus alascanus	Idiot	Color: bright red; dark blotches on fins; cheeks spiny. Length to 2 feet.	Newport, Oregon	11 to 12
I	Sebastes marinus	Ocean perch or rosefish	Color: orange red or red on dorsal surface; paler on ventral surface. Length to 2 feet.	Gloucester, Massachusetts	4 to 5

1/ Samples of Sebastodes ruberrimus and Sebastodes miniatus were prepared at the Fishery Technological Laboratory, Seattle, Washington, from fish caught off the coast of Washington by the Service's exploratory vessel John N. Cobb. These fish were frozen whole aboard the vessel. At the laboratory the fish were thawed in cold running water, filleted, packaged, and refrozen.

SEE CARD 2

3.249 (Cross Reference: 1.4)

Sample	Quality of Fillets 2/: Initial Acceptability and rating	Rating after storage at 0° F. for: 9-12 weeks	13-16 weeks	17-20 weeks	21-24 weeks	25-28 weeks	29-32 weeks
E	VG	M-F	F	F-U	U		
F	G	M	F	F	F	U	
G	G	U 4/					
H	— 3/	-	M	M-F	-	U	
I	VG	G	M	M	-	F	U

2/ Factors determining quality are appearance, flavor, texture, and odor; VG = very good (highest preference), G = good (normal quality of fresh fillets), M = medium (some loss in original quality), F = fair (appreciable deterioration in quality), U = unacceptable (poor to inedible).

3/ - indicates no observation.

4/ Unacceptable after 3 weeks.

3.33 BRITISH BRISLING AND SILD SARDINE CANNING

Anonymous
Food Manufacture XXVII, No. 12, 475-480 (December 1, 1952)

Seven British concerns are now engaged in the brisling and sild sardine canning industry, an industry that did not exist in that country 40 years ago. When the first company started operations in 1914, it faced the severe competition of some 120 Norwegian sardine factories. Today the number of Norwegian factories has increased to 300.

Previously, these nutritious fish on which Norway and other countries had built important industries were used in huge quantities in Great Britain as fertilizer for the land, and brought the fisherman less than £1 per ton.

With the development of modern methods the production has increased each year until it has now reached the vicinity of 20 million cans. The seasonal production, which was handled in 1940 by five factories, is now being handled by only two factories. The other three were closed down during the last war. Operations are no longer seasonal and between the two factories some 600 workers handle one million fish daily all the year round.

The fish are sent to the factories from Whitstable, Poole, Aldeburgh, Inverness, Southend, Deal, Brixham, Hythe, Brightlingsea, Newhaven, Dundee, Cork, and Donegal. At several of these places fish are quick-frozen and stored for handling during the off-season. From October to March the fresh fish are delivered to the canneries in four-stone iced boxes and no less than 15 tons are canned each day.

The quick-frozen fish are at times defrosted naturally in the open air, but more often by special temperature devices in a defrosting room. They are then treated in the same manner as the fresh fish.

Fresh fish are first scaled and washed in a single machine that consists of a latticed cylinder, slightly inclined from the horizontal, which rotates in a box of special construction where the scales are collected and disposed of to the artifical pearl industry.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

3.5 SALTING AND DRYING OF STOCKFISH

Rosenbrock, W.; Rowan, A. N.; Jackson, J.; and Stander, G. H.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952) 8-9

Headed and gutted stockfish varying in size from 1 to 7 pounds were salted by various methods (from dry salting to brine salting) at room temperature (70° - 85°F.), at 45°F., and at 40°F. Freshly caught fish were used and examinations were made 3 to 5 days after salting was started. Large stockfish (6 to 7 pounds) putrified before the salt could penetrate to the middle of the flesh. Fish up to 2 1/2 pounds were salted satisfactorily at the two lower temperatures only, although the rate of salt penetration was slower at the lower temperatures.

The average salt content percentages on the dry basis were:

	Room Temperature (70° - 85°F.)	40°F. and 45°F.
Large fish (6 - 7 lbs.)	34%	27%
Small fish (1 - 1 1/2 lbs.)	41%	35%

Brown streaks and blotches appeared to spread across the stockfish from the tail end. Neither the incidence nor the degree of browning was reduced by hanging the fish tail-down as compared with hanging the fish tail-up. Removal of the backbone from the tail portion did not seem to reduce appreciably the browning in the flesh.

Tests were made to determine whether stockfish could be satisfactorily prepared in the form of dry fish fibers. It was found desirable to lower the moisture content of the

(over)

 ABSTRACTER: D. T. Miyauchi

4.15 THE ISOLATION FROM SHARK (GALEORHINUS AUSTRALIS) LIVER OIL OF A MULTI-BRANCHED C_{18} SATURATED FATTY ACID FRACTION

Morice, Isobel M. and Sherland, F. B. (Department of Scientific and Industrial Research, Wellington, New Zealand)
Chemistry and Industry, No. 52, 1267 (December 27, 1952)

In this preliminary communication we report the isolation of a saturated C_{18} branched-chain fatty acid fraction from the liver oil of the school shark (Galeorhinus australis, Macleay) which Oliver and Shorland investigated for its major components.

A concentrate of the branched-chain fatty acids was obtained by repeated crystallization of the hydrogenated methyl esters, ca. 800 g., from acetone at -35° according to the procedures previously outlined and the soluble portion fractionated at ca. 0.1 mm. to yield a fraction whose equivalent corresponded to that of a methyl ester of a C_{18} saturated acid. This fraction (7.81 g.; sap. equiv. 295.9; iodine value 5.6) was chromatographed on a column of 70 g. of alumina as shown in Table I.

Fraction I contained some unsaturated unsaponifiable matter which was removed. The acid (2.29 g.) was crystallized from varying solvents at -70° (cf. Table II) until nothing further could be precipitated.

Fraction Z_5, $1F_5$ after cooling to -105° appeared to melt about -50°, had $(\alpha)_D^{14}$ + 2.3° in chloroform (c, 4.8) and the other characteristics shown in Table III (omitted).

The combustion analysis results agree with the values required for a C_{18} saturated acid. This is further confirmed by the saponification equivalent of 285.9 and the iodine value of 3.3.

(over)

 Reprinted in part

4.20 EFFECTS OF HIGH INTENSITY ELECTRON BURSTS UPON VARIOUS VEGETABLE AND FISH OILS

Astrack, A.; Sorbye, O.; Brasch, A.; and Huber, W. (Electronized Chemicals Corporation, Brooklyn, New York)
Food Research 17, No. 6, 571-583 (November-December, 1952)

The effects of sterilizing quantities of high-intensity electron bursts 1.5×10^6 Roentgen Equivalent Physical (rep) per gram from a 3 MV Capacitron in castor oil, cottonseed oil, and raw and boiled linseed oil at 20° and 115°C. are shown in Table 1 (this card, over). This amount of radiation caused only minor changes in the vegetable oils.

Initial experiments with electron-sterilized fish oils showed the development of rancidity during storage as the most pronounced change resulting from irradiation. Table 3 (over) demonstrates this fact. It also shows that the acceleration of the development of rancidity by radiation is not accompanied by the liberation of free fatty acids.

Figure 1 (omitted) shows that the development of rancidity proceeds more rapidly in whale oil irradiated with 1.5 million rep and stored at 25°C. than in the untreated control. The peroxide values of the irradiated samples were about 80 percent higher than the controls after 2 weeks of storage. Irradiation at -35°C. did not retard the development of rancidity in whale oil. Figure 2 (omitted) shows a similar pattern for the development of rancidity in fresh mackerel oil. Additional data presented in Figures 1 and 2 show that no noticeable increase in peroxide value occurred in whale oil and in mackerel oil provided the irradiation was carried out in vacuum or under nitrogen.

Propylgallate and butylated hydroxyanisole appeared to be considerably less radiation sensitive than the antioxidant systems normally present in the natural oils. The effects produced in cod liver oils containing 0.05 percent propylgallate and 0.1 percent butylated

(over)

 ABSTRACTER: Martin Heerdt

SARDINE CANNING IN GREAT BRITAIN

SATURATED FATTY ACID FROM SHARK LIVER OIL

SALTED AND DRIED STOCKFISH

EFFECT OF RADIATION ON FISH OILS

4.15

Evidence for the presence of two alkyl side chains is given by the C-methyl value which is equivalent to the liberation of 1.9 mol. of acetic acid. The only dimethylhexadecanoic acids reported are 15:15-dimethylhexadecanoic acid m.p. 50° and 2:2-dimethylhexadecanoic acid, m.p. 42°. The very low melting point and extreme solubility of this fraction may be due to two methyl or higher alkyl groups being attached to carbon atoms near the centre of the molecule. One methyl group attached near the centre of a chain lowers the melting point considerably as is the case with the methyloctadecanoic acids where 11-methyloctadecanoic acid melts 42° below nonadecanoic acid. The fraction appears somewhat similar to, but not identical with, a low melting C_{20} acid fraction containing three or four methyl groups obtained by Hansen and Shorland from butterfat.

The ultraviolet absorption curve of Z_5, $1F_5$ in 95% ethanol does not show any peak. It has a slight resemblance to the curves of 2:3-dimethyloctadecanoic acid and 2:3:4-trimethylhexadecanoic acid. At 210 mμ log ε is 2.53 which precludes the possibility of the acid being $\alpha\beta$-unsaturated, as in such a case it should have a peak about 200 mμ with log ε -3.9.

Table I

Chromatography of Z_5 methyl esters at −30°

Fraction	Wt. (g.)	Eluted with	Sap. equiv.	Iod. val. (Wijs)	Acid: Wt. (g.)	Acid: M.p. (°)	Acid: Reaction with tetranitromethane
1	2·82	Light petroleum ..	326·2	5·0	2·30	29—34	—
2	2·21	„ „ ..	280·7	0	1·82	30—44	—
3	0·15	„ „ ..	298·8		0·09	35—52	—
4	0·11	„ „ ..					
5	0·09	„ „ ..					
6	0·88	2% ether in light petroleum	278·3	0	0·55	34—36	—
7	0·12	10% ether in light petroleum					
8	0·16	„ „	288·8		0·08	11—13	+
9	0·05	Ether					

Table II

Crystallization of acid $Z_{5,1}$ at − 70°

Fraction	Conditions of crystallization	Filtrate: Fraction	Filtrate: Wt. (g.)	Filtrate: M.p. (°)	Precipitate Wt. (g.)
$Z_{5,1}$	Light petroleum 20 vol.	$Z_{5,1}F$	0·61	−12	1·61
$Z_{5,1}F$	Acetone .. 20 vol.	$ZF_{,1}F_2$	0·41	−35	0·18
$Z_{5,1}F_2$	Methanol .. 10 vol.	$Z_{5,1}F_3$	0·35	liquid at −70	0·05
$Z_{5,1}F_3$	Ether .. .. 10 vol.	$Z_{5,1}F_4$	0·14	„	0·02
$Z_{5,1}F_4$	Methanol .. 10 vol.	$Z_{5,1}F_5$	0·13	„	0·01

4.20 (Cross References: 4.5, 3.19)

hydroxyanisole, respectively, are shown in Figures 3 and 4 (omitted). The development of rancidity in natural cod liver oil that had been irradiated in air approximated that of whale oil and mackerel oil irradiated under similar conditions. When propylgallate and butylated hydroxyanisole were added in the aforementioned quantities, considerable protection was afforded against the development of rancidity during subsequent storage for 25 to 32 days at 25°C. Furthermore, peroxide formation seemed less pronounced in the irradiated cod liver oils containing the added antioxidant than in the controls.

Organoleptic changes in the irradiated oils did not appear to parallel the chemical changes; consequently, the oils were not influenced by the presence or absence of antioxidants. Oxygen as well as air apparently is involved in the development of irradiation-induced off-flavors because irradiation in vacuum or in the presence of inert gases did inhibit organoleptic changes.

TABLE 1

Effect of high intensity electrons on vegetable oils
Dose: 1.5 × 10^6 rep.

	Iodine number, g. I_2/100 g. oil: Irr.	Iodine number, g. I_2/100 g. oil: Control	Kreis test, optical density: Irr.	Kreis test, optical density: Control	Peroxide value, μ mol./g. oil: Irr.	Peroxide value, μ mol./g. oil: Control	Viscosity centipoise, 25°C.: Irr.	Viscosity centipoise, 25°C.: Control	Acid value, mg. KOH/g. oil: Irr.	Acid value, mg. KOH/g. oil: Control
Castor oil										
20°C.	81.0	89.7	0.11	0.18	0.3	0	721.0	692.0	0.4	0.4
115°C.+2.5% $ZnCl_2$ anhyd	83.3	83.3	.....	.....	....	....	749.0	647.0	15.5	11.6
Cottonesed oil										
20°C.	112.9	111.0	0.10	0.11	0.8	0.2	55.9	55.9	2.7	2.7
115°C.+2.5% $ZnCl_2$ anhyd	107.8	110.2	.....	.....	....	....	55.8	54.8	3.5	2.6
Boiled linseed oil										
20°C.	178.2	189.7	0.26	0.15	4.0	1.0	55.7	49.0	6.3	6.0
115°C.+2.5% $ZnCl_2$ anhyd	171.1	176.2	.....	.....	....	....	44.7	44.5	6.1	5.4
Raw linseed oil										
20°C.	171.2	177.4	0.13	0.13	2.6	2.1	55.0	49.0	6.4	5.8

TABLE 3

Free fatty acids in irradiated fish oils
Dose: 1.5 × 10^6 rep.

	Acid values (mg. KOH/g. oil) at various storage times (days): 0	13	52
Raw whale oil			
Control	2.6	2.6	2.6
Irradiated	2.6	2.6	2.6
Refined whale oil			
Control	0.4	0.4	0.4
Irradiated	0.4	0.4	0.4
Raw cod liver oil			
Control plain	7.3	7.3	7.3
Control—0.05% propylgallate	8.1	7.8	7.8
Irradiated plain	7.3	7.3	7.3
Irradiated—0.05% propylgallate	8.1	7.8	7.8
Refined cod liver oil			
Control plain	1.2	1.2	1.2
Control—0.05% propylgallate	1.4	1.3	1.4
Irradiated plain	1.3	1.3	1.2
Irradiated—0.05% propylgallate	1.4	1.3	1.4

3.33 (Cross References: 1.2, 1.0146)

The washed and scaled fish are brined in vats and then drained in baskets before being taken to the rodding tables.

Rodding, which includes the important job of grading the fish, consists of placing the heads of the fish into a series of slots and impaling them on a thin steel rod. The rods on which the fish are then hanging are fitted into frames and the frames are loaded onto trolleys which are used to transport the fish through the automatic smoking ovens.

The new automatic smoking ovens have produced a marked improvement in the general quality of the final product. Depending on their size, the rodded fish are moved through the oven channel in from 40 to 75 minutes, which allows for the removal of some of the moisture contained in the flesh and for the absorption of the desired amount of aromatic smoke flavor. Fired with oak logs, the smoking oven is equipped with temperature regulators and large fans and flues arranged so that the channel is divided into three compartments, the first for drying, the second for smoking, and the third for cooking. The whole oven continuously deals with 80,000 fish.

After smoking, the fish are headed by contact with a revolving band knife, packed by hand into cans to which either oil or tomato sauce is added, passed through a double seamer and processed in vertical retorts. From the retorts the cans are conveyed to an automatic washer which consists of a boiling solution of detergent, a tank of clean boiling water and a steam heated, hot-air drying tower. After drying, the cans are given a final polish and are cased up.

In the packing room, where the cans are next taken, they are strip labeled, and wrapped in red or white transparent grease-proof paper upon which the label is pasted. In all, some 14 different sizes and shapes of can, including the herring pack, are produced.

3.5 (Cross Reference: 3.7)

fish below 25% but not below 5% before shredding. The shredded product was good in appearance, but after 3 months' storage it was rather insipid when made into fish cakes.

6.195 AMINO ACID REQUIREMENTS OF CHICKENS AND TURKEYS -- A REVIEW

Almquist, H. J.
Poultry Science 31, No. 6, 966-981 (November, 1952)

1. Information bearing on the specific amino acid requirements of chicks, poults and laying chickens has been reviewed. The requirements as indicated at present date are summarized in Table 1(this card over).

2. Amino acid requirements increase as the protein level in the diet increases, and vice versa.

3. Amino acid requirements expressed as a percentage of the dietary protein appear to decrease as the protein level increases.

4. Amino acid requirements are influenced in some cases by size, age and variety of fowl.

5. The general effect of antibiotics is not to decrease protein or amino acid requirements but possibly to permit more efficient utilization.

(over)

Author's summary

6.133 THE CHAYEN PROCESS FOR EXTRACTION OF OILS AND FATS

Coulson, J. M.
Nature 170, No. 4334, 881 (November 22, 1952)
Food Processing 14, No. 1, 64 (January, 1953)

Normally, fats and oils are extracted from naturally occurring cellular materials by the use of a hot solvent. This procedure usually requires many hours of heating with steam, and frequently results in the formation of undesirable products of lower grade.

In the Chayen process, crushed bones are passed, together with a stream of water, into a modified disintegrator or hammer mill where complete fat rendering is accomplished almost instantaneously. Disintegration is not achieved by the normal disintegrator blades but by six banks of 3/4-inch diameter, rounded end, replacement beaters arranged to clear the circular mill housing by 4 inches (see diagram, this card, over). At 3000 rpm or a blade-tip speed of 12,000 feet per minute, these beaters strike the surface of the water with a tremendous impact and create shock waves or impluses that rupture the cell walls of the tissue and facilitate extraction. The shock waves generated are in the sonic range and are transmitted in all directions through the water stream. The waves rupture the cells up to a depth of 2 inches in the bone material, release the fat, and replace it with water.

Upon leaving the mill the fat and degreased bone material are separated by gravity from the stream of water. When further purified, the fat is of high quality. After leaving the mill the bone material is ready for use in making glue or for drying to make bone meal.

(over)

 ABSTRACTER: Martin Heerdt

6.132 LOSS OF B-VITAMINS DURING THE PRODUCTION OF MEAL

Anonymous
Meldinger fra S.S.F., No. 7, 129-133 (November, 1952)

The steps in herring meal production where at least partial destruction of B-vitamins might be expected to take place were studied. A laboratory experiment showed that forty to sixty percent of the total amount of vitamin B_{12}, riboflavin, niacin and pantothenic acid in fresh frozen herring was in the stickwater. The importance of producing "whole meal" was indicated by these results.

In the drying process, laboratory experiments showed that vitamin B_{12} was noticeably affected when the presscake was dried at 80° - 100°C. for 5 hours.

Material	% Fat-free dry material	Vitamin content μg/g fat-free, dry material			
		Vit. B_{12}	Ribo-flavin	Niacin	Panthothenic Acid
Raw herring	20.4	0.54	10.4	145.0	49.0
Stickwater	8.7	1.08	22.6	430.0	154.0
Solubles	39.1	0.99	20.0	395.0	152.0
Solubles, dried	84.0	0.64	19.0	400.0	145.0
Presscake	39.0	0.39	7.1	82.0	20.2
Presscake, dried	82.9	0.34	7.6	84.0	20.5
Whole meal, wet	40.3	0.50	9.5	143.0	46.0
Whole meal, dried	83.4	0.38	9.7	142.0	43.0

(over)

 ABSTRACTER: Neva L. Karrick

6.195 EVALUATION OF THE BIOLOGICAL VALUES OF THE PROTEINS IN FISH MEALS BY THE NITROGEN RETENTION METHOD

Sure, Barnett and Easterling, Leslie (Department of Agricultural Chemistry, University of Arkansas, Fayetteville)
Journal of Nutrition 48, No. 3, 401-405 (November 10, 1952)

The authors determined the biological values of fish meal proteins by the nitrogen balance method of Mitchell, 1944, in which the values are expressed as the percent of absorbed nitrogen retained by the animal. Using these biological values and the percent digestibility they calculated the percent of net utilization.

Albino rats of the Wistar strain were used, and in all groups the sexes were divided equally. Each group contained twelve 28-day-old animals weighing from 50 to 56 grams apiece at the start of the experiment. All groups received fish meals at an 8 percent protein level, and each animal consumed 8 grams of ration daily.

Dried whole eggs and dried non-fat milk solids were also evaluated as a part of the nitrogen retention studies. Urinary and fecal balances were carried out for 7 days on an egg standardizing ration and also for 7 days on the experimental rations containing the various fish meals. In every instance the animals were permitted to become accustomed to consuming the entire rations for a pre-test period of from 3 to 5 days before beginning the nitrogen balance studies.

Table 1 (omitted) indicates that the protein-content of the fish meals varied from 35.0 to 69.7 percent, the fat from 2.1 to 15.3 percent, the ash from 11 to 29.3 percent, and the moisture from 2.3 to 8.4 percent. The rations could not be adjusted on an

(over)

 ABSTRACTER: Martin Heerdt

AMINO ACID REQUIREMENTS OF POULTRY

LOSS OF B-VITAMINS DURING MEAL PROCESSING

IMPULSE EXTRACTION OF OILS

VALUES OF PROTEINS IN FISH MEALS

6.132 (Cross Reference: 6.134)

Material	Weight g.	Vit. B_{12} mg.	Riboflavin mg.	Niacin mg.	Pantothenic acid mg.
Herring	1000	0.11	2.13	29.8	10.2
Presscake	437	0.07	1.20	14.0	3.5
Stickwater	456	0.04	0.90	17.1	6.1
% vitamin in the stickwater		36.3	42.4	57.2	60.0

6.195

Table 1. Requirements of the essential amino acids for chickens and turkeys

Amino Acid	Young chicken	Young turkey		Laying chicken
	percent of diet	percent of diet		percent of diet
Arginine	1.2	1.4	1.6	
Lysine	0.9	1.3	1.5	0.50
Histidine	0.15			
Methionine or	0.8	0.75	0.87	
Methionine	0.45	0.45	0.55	0.28
Cystine	0.35	0.30	0.35	
Tryptophan	0.2	0.22	0.26	0.15
Glycine	1.0	0.9	1.0	
Phenylalanine or	1.6			
Phenylalanine	0.9			
Tyrosine	0.7			
Leucine	1.4			1.4
Isoleucine	0.6	0.72	0.84	
Threonine	0.6			
Valine	0.8			
For Protein Level	20.0	24.0	28.0	15.0

6.195

isocaloric basis. Similarly, because of the great variations in ash, the total mineral content of the rations was also different.

According to the findings shown in Table 2, below, the proteins of dried whole eggs and dried non-fat milk solids rank somewhat above the various fish meals in percent of absorbed nitrogen retained in the body. The fish meals, however, do have high biological values.

TABLE 2

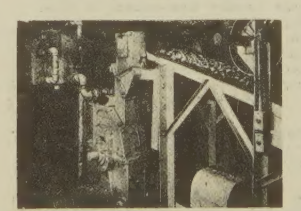
The relative biological values of the proteins of various fish meals, dried whole eggs, and dried non-fat milk solids fed at an 8% protein level. Daily food intake, 8 gm. Daily nitrogen intake, 102.4 mg

SOURCE OF PROTEIN	BODY WEIGHT	FECAL N [1]	MET.[2] N IN FECES	FOOD N IN FECES	ABSORBED N	N IN URINE	MET. N IN URINE	FOOD N IN URINE	FOOD N RETAINED	TRUE DIGESTIBILITY	BIOLOGICAL VALUE [3]	NET UTILIZATION [4]
	gm.	mg	mg	mg	mg	mg	mg	mg	%	%		
Sardine meal	72.5	14.9	12.7	2.2	100.2	33.3	19.7	13.0	86.6	97.8	86.4	84.5
Menhaden fish meal	66.5	21.1	10.1	11.0	91.4	33.5	21.5	12.0	79.4	89.2	86.9	77.5
Red fish meal	67.3	23.7	10.2	13.5	88.9	33.8	22.5	11.3	77.6	86.8	87.3	75.8
Alaska herring meal	76.7	20.8	7.7	13.1	89.3	36.9	18.8	18.1	71.2	87.2	79.7	69.5
Herring meal with fish solubles	68.6	20.6	10.0	10.6	91.8	38.7	22.4	16.3	75.5	89.6	82.2	73.6
Anchovies meal	66.6	35.0	11.0	24.0	78.4	35.1	21.5	13.6	64.8	76.6	82.6	63.1
Crab meal	65.9	40.7	10.7	30.0	72.4	32.4	24.4	8.0	64.2	70.7	85.9	60.2
Dried non-fat milk solids	68.9	21.0	10.4	10.6	91.8	36.3	23.1	7.2	84.6	89.6	92.2	82.6
Dried whole eggs	78.8	13.3	11.2	2.1	100.3	25.5	22.0	3.5	96.8	97.9	96.5	94.5

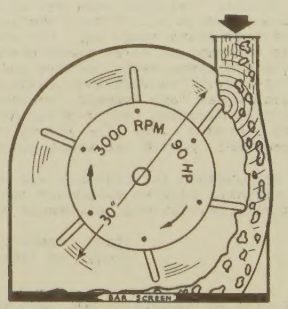
[1] N signifies Nitrogen.
[2] Met. signifies Metabolic.
[3] Per cent of absorbed nitrogen retained in the body.
[4] The value for the true coefficient of digestibility multiplied by the biological value divided by 100.

6.133 (Cross Reference: 6.23)

The Chayen technique is important not only in that it has provided an improved fat extraction process, but also in that it has provided a new chemical engineering principal. In short, it is now possible to use high-speed impulses to break down mechanical barriers or, in this instance, cell walls. When compared with batch heat extraction of fats, the continuous process offers many advantages in the form of simplified plant layout and operation as well as savings in fuel. Practical applications of the Chayen process are now in commercial operation in three British plants and in one Canadian plant. Pilot plant experimental runs in Canada have shown that oil may be extracted from herring by the Chayen process. It is therefore considered likely that the extraction of vitamin oils from fish livers by this method also will prove practicable.



View of impulse extractor installed at the plant of W. Harris, Ltd., Toronto, which renders the fat from bone scraps



Schematic diagram, roughly to scale, shows how a hammermill is adapted to impulse extraction. Each of the six banks of hammers is made up of bars having a ¾" by ¾" cross section and a blunt, rounded tip. Water conditioning the material to be rendered enters the top, and is struck 300 times a second by these banks of hammers. The shock waves are transmitted throughout the water stream in all directions. Discharge is through a graduated bar screen at the bottom with openings varying from ¼" on the feed side to 2" on the other

1.0142 FISHERIES REPORT FOR THE YEAR 1951 (DENMARK)

Anonymous
Fiskeri-Beretning For Aret 1951, Fiskeriministeriet, Copenhagen, Denmark, 210 pages with English summary

A total of 19,623 fishermen were employed in Denmark in 1951 as against 19,882 in 1950. The total fishing fleet consisted of 16,065 vessels, of which 7,697 were motor driven, 18 were above 50 gross tons, 1,293 were between 50 and 15 gross tons, 2,335 were between 15 and 5 gross tons, and the remainder were below 5 gross tons.

Danish catches of fish and shellfish amounted to 278,300,000 kg. valued at 177,100,000 Kroner to the fishermen, as compared with a 1950 catch of 239,000,000 kg valued at 157,200,000 Kroner. Yields of edible fish and shellfish increased by only 1,600,000 kg. Waste fish yields, however, increased by 46,000,000 kg. The mussel catch declined by 8,500,000 kg. Due to a small rise in the price of plaice, dab, cod, and mackerel, 11,700,000 additional Kroner were obtained in 1951 from the edible fish and shellfish. The remaining 8,200,000 Kroner were derived from the increase in the catch of waste fish.

The herring fisheries yielded about 2,000,000 kg. less than in 1950. In the North Sea, however, the yield was almost double that of 1950, whereas the Baltic and the Belt Sea showed only a modest increase. The herring catch in the Skagerak declined by about 4,000,000 kg. as compared with 1950, while a considerably smaller decline occurred in the Kattegat.

Cod yields increased by 3,000,000 kg. The Belt Sea and the Baltic together produced almost 50 percent of the total catch. Mackerel catches showed little change over the previous year with 85 percent of the whole quantity being taken in the Kattegat and the

(over)

 ABSTRACTER: Martin Heerdt

2.116 SOME MODERN METHODS OF FISH DETECTION

Cushing, D. H.; Devold, Finn; Marr, John C.; and Kristjohnsson, H.
FAO Fisheries Bulletin 5, Nos. 3-4, 95-119 (May-August, 1952)

During recent years fishermen have benefited greatly from advances in science and engineering. Of all the new tools of his trade acquired during this period, the echo sounder for fish detection must be considered the outstanding development of commercial fisheries.

Prior to World War II echo sounders were, in the main, visual instruments, but it was the paper recorder with its pictorial "memory" that finally caught the imagination of fishermen. Visual echo sounders were used successfully as fish detectors as early as 1933, and the first paper recorder was used in fishing in 1935 by Oscar Sund, a Norwegian marine biologist. Sund discovered that the recording echo sounder could be used to register compact schools of spawning cod in Lofoten. Before the introduction of the echo sounder into the cod fisheries, the fishermen discovered the shoals by trial and error. Even when they caught fish they could not be certain they were fishing the most compact portion of the shoal. The echo sounder made it possible to locate the fish, estimate their density, and to determine the depth at which the fish were schooling.

The echo sounder has found use in a number of commercial fisheries; it has been used to map the location of prawn beds, and in the catching of squid in Japan. Echo sounders can be used to locate any type of pelagic fish appearing in sufficiently large schools, and has therefore found wide use in herring fisheries.

The identification of different species of fish with echo sounders cannot be done with certainty; however, investigators have attempted to classify the different types of

(over)

 ABSTRACTER: Dayton L. Alverson

3.5 THE WATER TRANSFER IN CODFISH MUSCLE IMMERSED IN SODIUM CHLORIDE SOLUTIONS

Fougére, H. (Gaspé Fisheries Experimental Station, Grande Riviere, P. Q.)
Journal of the Fisheries Research Board of Canada 9, No. 8, 388-392 (December, 1952)

Reay studied the changes in weight of herring fillets immersed in salt solutions. He showed that after 10 days, herring muscle took up water and therefore gained weight in salt solutions of concentrations up to 18 percent at 0°C. Likewise, Callow showed that pork muscle took up water from solutions containing as much as 20 percent salt at 0°C. Tarr observed that flounder fillets treated in weak brine increased up to 3 percent in weight. He attributed this increase to the swelling of proteins in salt solutions. Chipman found that the weight of codfish muscle soaked in fresh water increased up to 30 percent of its original weight. This capacity to absorb water is a property of dead tissue, as was shown by Thomas, who observed the swelling of dead frog muscle in a hypertonic sodium chloride solution.

The purpose of the present investigation was to study the behavior of water in codfish muscle as affected by sodium chloride. The author accomplished this by following the change in weight of samples of muscle soaked in brines of various concentrations. On the basis of this work, he gives an explanation of the mechanism whereby water is set free during the salting process.

The author, in his experimental work, used equal size cubes of codfish, each weighing about 25 grams and containing 80 percent moisture. Cubes of known weight were added, one each, to several beakers containing 50 grams of the same salt solution of known concentration. At successive intervals, a sample was drawn from its beaker, set aside to drain for about 2 minutes, then weighed.

(over)

 ABSTRACTER: F. Bruce Sanford

4.1 LIPIDES OF PYLORIC CAECA OF COD (GADUS MACROCEPHALUS TILESIUS)

Hirao, Shuichi and Kinumaki, Toyosuke
Bulletin of the Japanese Society of Scientific Fisheries 17, Nos. 8-9, 242 (1952)

Lipides of pyloric caeca contain large amounts of vitamin A. So, various works on vitamin A of the lipides have been reported by many investigators. But we have very little knowledge about the nature of lipides of pyloric caeca. From such a point of view, the authors studied lipides of pyloric caeca of cod (Gadus macrocephalus).

Our experiments are as follows:

1. Preparation of lipides.
Chopped pyloric caeca are heated under reduced pressure to remove the greater part of water of this tissue. Then alcohol and excess benzene are added and distilled. By such treatment, water remaining is distilled out as triazotropic mixture (alcohol-benzene-water). Lipides are obtained after removing excess bezene.

2. Properties and composition of lipides.
Lipides of cod pyloric caeca are characterized by the following points.
a) Large amounts of free fatty acids and small amounts of neutral fats are remarkable. This is due to the fact that the neutral fats of the original lipides had already undergone considerable autolysis.
b) Large amounts of unsaponifiable matter, vitamin A, sterol and phosphatide are also remarkable. It is probably characteristic of lipides of pyloric caeca, comparing its data with that of liver oil (unsap., ca. 1%; vitamin A, ca. 10,000 U.S.P. units; phosphatide, trace).

(over)

 English summary

REPORT OF THE DANISH FISHERIES FOR 1950

WATER TRANSFER IN CODFISH MUSCLE IN BRINE

MODERN METHODS OF FISH DETECTION

LIPIDS OF THE PYLORIC CAECA OF COD

3.5 (Cross Reference: 0.32)

The observed change in weight was due apparently to the proportionality at which the salt from the solution and the water from the fish were exchanged. If the weight of salt absorbed were deducted from the change in weight at the particular instant, the result would be the weight change due to water only. Therefore the author expressed the results according to the formula

$$K = \frac{(P_S - P_O - H)100}{P_O}$$

where K is the percent change in weight due to water only, P_S is the weight of the sample after salting, P_O is the initial weight of the sample, and H is the grams of salt in the sample.

The author concluded from his work that codfish muscle immersed in salt solutions will either absorb water or give up water according to the quantity of salt that diffuses within. It will imbibe water, provided the average concentration of brine does not exceed about 10 percent. Beyond this concentration, the fish muscle loses water.

These results, and others, indicate that the direct effect of salt on the removal of water from fish in salt solutions is to release water held as water of imbibition by the proteins. This is accomplished when sufficient salt has diffused within the shell of water surrounding the protein micelles to establish a concentration of 10 percent or more.

In salt solutions of 10 or 12 percent concentration, surface proteins must be denatured and thus give up water; but others at some depth within the tissue, by reason of a concentration gradient, must imbibe a weight of water exceeding that lost by the denatured ones.

4.1 (Cross Reference: 1.5)

3. Properties and composition of fatty acids.
The fatty acids composition of the lipides is analogous to that of cod liver oil.

4. Unsaponifiable matter.
Unsaponifiable matter of the lipides is composed of cholesterol (ca. 40%), vitamin A (ca. 30%), substance containing a conjugated double bond like vitamin D (ca. 10%), higher alcohols and hydrocarbon (ca. 20%). The authors obtained an unsaturated alcohol as anthraquinone β-carboxylate (m.p. 133-134°C.). Free alcohol recovered from this ester melts at ca. 24°C. and its iodine value is 143. Further investigation of this alcohol was not pursued.

I.0142 (Cross Reference: 9.2)

Skagerak. Cod taken in Greenland waters by the five companies operating there totaled 5,000,000 kg. prior to salting. An additional 400,000 kg. of cod taken were used unsalted.

Only 50 vessels fished Barents Sea in 1951. The total yield, which was landed in British ports, was 500,000 kg. valued at 800,000 Kroner as compared with 800,000 kg. and 900,000 Kroner in 1950. The expeditions that took part in the herring fisheries off Northern Iceland returned mainly with plaice, herring, cod, and haddock totaling 1,400,000 kg. valued at 1,500,000 Kroner.

As in the previous year, the fresh water fish yield from lakes and rivers was estimated at 1,000,000 kg. and valued at 1,000,000 Kroner. The pond culture of trout for export yielded 2,500,000 kg. valued at 12,100,000 Kroner in 1951 as compared with 2,100,000 kg. valued at 10,300,000 Kroner in 1950. Oysters dredged from Lime Fiord totaled 2,600,000 in 1951-52 as compared with 3,100,000 in 1950-51.

Swedish vessel landings in Danish ports totaled 15,000,000 kg. valued at 7,000,000 Kroner and consisted mainly of herring. Imports of fresh fish originating mainly from the above Swedish landings were valued at 11,400,000 Kroner. Imports of salted codfish and herring were valued at 14,100,000 Kroner, while the canned fish imports were valued at 1,200,000 Kroner. Imports of fish meal and herring oil, medicinal fish oil, and other fish and whale oil were valued at 14,900,000; 6,900,000; and 41,100,000 Kroner, respectively.

Exports in 1951 consisted of 91,000,000 kg. of fresh fish valued at 147,000,000 Kroner; 15,400,000 kg. of various fresh shellfish and cuttlefish valued at 3,900,000 Kroner; and 14,200,000 kg. of cured fish products valued at 36,400,000 Kroner. Exports of canned fish products totaled 3,300,000 kg. and were valued at 17,000,000 Kroner. Salted herring and codfish exported reached 10,700,000 kg. and were valued at 18,300,000 Kroner.

2.116

traces that may be distinguished. These identifications are primarily based on the differences in the size of a shoal relative to the area covered by the sound beam at the depth of the shoal.

There are five main factors in the production of a fish trace which are summarized as follows: (1) size of the fish; (2) presence, shape, and size of air bladder; (3) shoaling density of fish; (4) size of the shoal in relation to frequency of the sounder; and (5) size of the shoal in relation to the spread of the beam angle of the sound.

Echo sounders have played an important role in the study of fish behavior. Diurnal migrations have been shown by comparing the night and day depths of a number of shoals. Vertical migration of fish in relation to light intensity has also been studied. The Norwegian vessel G. O. Sars has been fitted with Asdic in addition to standard echo sounding equipment. Asdic operation is similar to that of echo sounding, but where echo sounding oscillators are fixed in the hull of the ship and sound waves are reflected from the sea bottom, Asdic oscillators are rotatable and the impulses are transmitted horizontally. Asdic equipment is said to be capable of locating fish shoals at a range of 2500 yards. Through the use of Sars' Asdic equipment a pelagic herring industry has been established in the Norwegian Sea.

Another unique method of fish detection is the use of aircraft. The advantages of aerial scouting over that from the mast head of a ship are given as follows: (1) a greater area can be scouted during a given period of time; (2) a greater area can be scouted at a given instant, owing to the greater height of the observer above the sea surface; and (3) sub-surface shoals are more readily visible than they would be from a ship. Aerial scouting has been used in the California tuna and basking shark fisheries, the Washington pilchard fishery, the Icelandic herring fishery, and in the East coast menhaden fishery.

6.132 FISH MEAL

Lewis, A. M.; Stander, G. H.; Plumbridge, N.; and Davies, W. G.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952), 16-18

Spontaneous heating in 100-pound bags of steam tube, rotary-drum-dried pilchard meal was found to depend primarily upon the fat and moisture content of the meal. All temperature measurements were made at the center of the bag. When the plant was in full production the pilchard meal coming from the bagging cyclone contained 11 percent moisture, 9 percent fat and was at an average temperature of 103°F. Within 6 hours after standing in open or closed bags, upright and apart, the meal rose in temperature to 133°F. After 21 hours, however, the meal had returned to its initial bagging temperature, and by the end of 76 hours it had cooled to 70°F., or 10°F. above room temperature.

Artificially increasing the moisture content of the meal to 18 percent (fat content 7.4 percent) did not result in any greater amount of heating than in the foregoing meal. Cooling, however, was somewhat slower. Pilchard meal having an artificially increased fat content of 13.4 percent (moisture content 7.7 percent) when bagged at 72°F. rose in temperature to 166°F. in 19 hours and cooled to 70°F. in 90 hours.

Stacking the bags of fish meal immediately after filling, in stacks 3 x 3 x 3 bags, resulted in a temperature of 127°F. in the bag at the center of the stack in 6 hours. The meal returned to the initial bagging temperature of 103°F., however, within 35 hours after bagging. After 90 hours of cooling it was still at 80°F.

Errors in the protein values of fish meal as a result of sampling sometimes differed by as much as 4 percent and more often than not by more than 2 percent. In contrast,

(over)

 ABSTRACTER: Martin Heerdt

6.193 THE NUTRITIVE VALUE OF FISH MEAL AND CONDENSED FISH SOLUBLES
VI. AN UNIDENTIFIED GROWTH FACTOR(S) IN FISH MEAL

Biely, Jacob; March, B. E.; and Tarr, H. L. A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 92, 10-13 (October, 1952)

Chick biological tests were carried out to determine the growth-promoting ability of herring meal.

In Test 1, soybean-oil meal and herring meal were added in varying proportions to the basal diet. Protein, calcium and phosphorus were adjusted to the same level in all diets. The inclusion of 5% to 10% herring meal in the basal ration slightly increased the growth rate of the chicks. Rations containing both soybean-oil meal and herring meal promoted faster growth than rations in which either of these protein supplements was used alone.

In Test 2, the basal diet was supplemented with liver meal and dried distillers' solubles. Soybean-oil meal and fish meal were added in various proportions. The addition of fish meal again promoted better growth indicating that fish meal supplied some factor or factors not present in the liver meal or dried distillers' solubles.

The third test ration contained optimum amounts of all the known vitamins, since the possibility existed that the fish meal factor(s) could be a known vitamin. In addition, the antibiotic procaine penicillin was added to the diet. However, it was found that when 5% herring meal in addition to penicillin was included in the ration there was a statistically significant increase in the rate of growth of the chicks as compared with

(over)

 ABSTRACTER: W. N. Sumerwell

7.641 THE DETERMINATION OF VITAMIN B_{12} ACTIVITY IN HUMAN SERUM

Rosenthal, Harold L. and Sarett, Herbert P.
Journal of Biological Chemistry 190, No. 1, 433-442 (November, 1952)

A method for the extraction and measurement of vitamin B_{12} activity in human serum with Lactobacillus leichmannii has been developed. The assay procedure used is that of Thompson et al as modified by Register and Sarett.

Blood samples were obtained by venipuncture and allowed to clot thoroughly at 6°C. After centrifugation, the serum was removed for analysis. Since it was necessary to liberate the bound vitamin B_{12}-active material from the serum proteins and to remove most of the protein prior to assay with L. leichmannii, a method was evolved for carrying out both steps at the same time. The serum was diluted with acetate buffer and distilled water. The mixed solution at pH 5.1 was immersed in a boiling water bath for 30 minutes. After cooling and centrifugation, a clear supernatant was obtained. The pH was adjusted to 6.9 and the serum solution was made up to a final dilution of 1:10. This solution is used in the L. leichmannii assay. Crystalline vitamin B_{12} added to serum can be quantitatively recovered by this procedure.

Samples of serum from twenty-four individuals in the post absorptive state were found to contain 0.08 to 0.42 mμg. of vitamin B_{12} per ml., averaging 0.20 mμg. per ml. Over 90% of the total vitamin B_{12} activity measured in this manner is inactivated by heating at pH 11, and the activity therefore appears to be due to vitamin B_{12}.

Dialysis experiments using normal serum were performed and the results show that vitamin B_{12} is firmly bound and cannot be removed by dialysis under these experimental

(over)

 ABSTRACTER: W. N. Sumerwell

6.192 SOME PROPERTIES OF AN UNIDENTIFIED CHICK GROWTH FACTOR IN CONDENSED FISH SOLUBLES

Mange, H.; Denton, C. A.; Lillie, R. J.; and Bird, H. R. (Agricultural Research Administration, Beltsville, Maryland)
Poultry Science 31, No. 5, 927 (September, 1952)

Preliminary studies on an unidentified chick growth factor, or factors, present in condensed fish solubles have revealed some of its properties. The factor was found to be stable to autoclaving for 30 minutes at pH 2.0, 3.0, 4.0, 5.0, 7.0, 9.0, and 11.0; however, a similar treatment at pH 1.0 apparently destroyed its growth-promoting property. Lipoidal substances present in fish solubles were separated by centrifugation and discarded. The growth factor was found to be soluble in water, 50% and 60% alcohol, dialyzable through a cellophane membrane, and insoluble in ether. Most of the growth-promoting activity was removed from fish solubles by extraction with 70% methanol or 80% ethanol. The factor was not adsorbed on norite at pH 3.0 or on Attaclay SF at pH 4.0. It was stable to temperatures under 100°C. in vacuo and was not destroyed by light. When the essential amino acids were fed in equivalent amounts as supplied by 4% fish solubles, the chick growth response did not exceed that obtained with the negative control group. L-lyxoflavin, as well as indoleacetic acid, also failed to give a growth response, indicating that the chick growth factor present in fish solubles is not identical with these substances.

 Reprinted in whole

SPONTANEOUS HEATING IN FISH MEAL

VITAMIN B_{12} ACTIVITY IN HUMAN SERUM

UNIDENTIFIED GROWTH FACTOR IN FISH MEAL

CHICK GROWTH FACTOR IN FISH SOLUBLES

7.641

conditions. In addition it was found that human serum is able to bind limited amounts of added vitamin B_{12}.

6.132 (Cross Reference: 6.139)

repeat, triplicate analyses of given samples gave protein values on a dry basis that agreed with each other within 0.2 percent.

A new method has been devised for the rapid estimation of moisture in fish meal. This method is based on the use of wet and dry bulb thermometers for measuring the relative humidity of air that has traveled through a 60-gram sample of fish meal contained in a tube. Forced air circulation has made it possible to determine the moisture content to within a limit of ± 0.7 percent moisture (mean error 0.24 percent) in 5 minutes. The values tabulated below were obtained with pilchard meal.

Relative humidity in percent	Moisture content in percent
35	5.7
45	6.9
55	8.5
65	10.5

6.192 (Cross Reference: 6.15)

6.193

those fed the basal diet. It is concluded that fish meal supplied a factor(s) that is not supplied by the basal ration or by the addition of penicillin.

Turkey poults also were used in biological tests to demonstrate the presence of the unknown growth factor(s) in fish meal. The basal ration contained ground corn and soybean meal as well as adequate levels of the known vitamins. The addition of 5% herring meal again stimulated the growth rate. The addition of dried brewers' yeast did not produce additional growth response.

2.114 FIVE-BLADE PROPELLER

White, Irving
Fishing Gazette 70, No. 1, 68, 75 (January, 1953)

A Michigan firm has developed a new five-blade propeller designed especially for the class of vessels that employ propellers of around 38 to 48 inches in diameter.

Tests were run in which three, four and five blade propellers of various shapes and areas were compared as to general performance, fuel consumption, vibration, speeds, etc. These tests were conducted over periods of several weeks at a time, under conditions of actual service in the field. In each test, the 5-blade wheel was said to excell the other types by 3 to 9 percent in boat speed running light, boat speed running under tow, and in fuel consumption. Stern vibration, too, was materially reduced or completely eliminated. One vessel owner stated that prior to installation of the new propeller he found it necessary to re-caulk every three or four months, whereas now the vessel showed no signs of leakage. Another operator claimed that a leak at the stern bearing was completely stopped by the smooth operation of the five-blade wheel.

2.116 UNDERWATER CAMERA USED TO PHOTOGRAPH OYSTERS

Anonymous
Atlantic Fisherman 33, No. 11, 16 (December, 1952)

In its efforts to promote oyster cultivation, the Tidewater Fisheries Commission of Maryland recently used a new turbidity-eliminating camera to obtain pictures of growing oysters in their natural surroundings. Operation of this equipment in muddy waters is made possible by the substitution of a clear medium in place of the muddy water between the camera and the object to be photographed.

Lighting is provided by an eight-bulbed electronic flash system. The present battery capacity permits approximately 500 flashes per set.

A stereoscopic camera is used so that the third dimension of depth can be shown. Two pictures, 2 1/8 x 2 1/8 inches each, are taken at a time, and the camera is able to take 80 such pairs in one immersion. Underwater stereoscopic pictures have been taken both in black and white and in color. Most work to date, however, has been done with black and white, which has the advantage of quick development.

Despite its many potentialities, the underwater camera was found to be impractical as a means of taking an oyster census. This is because oyster beds are sometimes covered with shifting sands or mud, that hide them from the camera's view.

The equipment weighs 550 pounds and is raised and lowered from a boom. The camera is operated by a plummet; that is, a lead weight that trips the shutter as it touches the bottom.

2.117 POWERFUL NORWEGIAN WHALECATCHER

Anonymous
World Fishing 1, No. 9, 327-328 (December, 1952)

Claimed to be the largest and most powerful vessel of its type, the A/S Thor Dahl is Norway's first diesel-engined whalecatcher. It is the first whalecatcher in the world to be fitted with a variable pitch propeller. The vessel has an over-all length of 210 feet, a molded depth of 18 feet 4 inches and a beam of 33 feet.

The ship's double bottom provides for fresh water and oil storage. Large field tanks permit long-range operations.

The main engine is a six-cylinder diesel developing 2,700 b.h.p. at 225 r.p.m. The engine is regulated by oil-hydraulic governors arranged so that the required engine revolutions can be maintained even in heavy seas, at the same time, protecting the engine against overloading when the vessel pitches.

The variable-pitch propeller is the largest of its type made in Norway and can be adjusted to any pitch by levers from the engine room, on the bridge or from the gunner's platform.

Auxiliary power is provided by two diesel generator sets consisting of a six-cylinder, 4-stroke trunk diesel engine with directly-coupled dynamos for 220-volt D.C. operation.

A complete steam plant with oil burning boiler, condenser and the necessary auxiliaries is installed to operate the whale winch and supply steam for heating.

(over)

2.1121 THE "PHANTOM" PELAGIC TRAWL

Larsson, Karl-Hugo
Fishing News, No. 2067, 7, 9 (November 29, 1952)

The "Phantom" trawl equipment was designed by the author to make trawling operations possible on rough ground without the use of bobbins or other arrangements for protecting the net.

The floating wing door, which forms the basis of the "Phantom" trawl, is shaped like an aeroplane wing, with a plane surface on the pressure side and a curved back. A built-in weight at the lower end of the door gives it an initial stability as it settles into the water. The towing warp is fastened to the door by a bridle of two chains, one fixed and the other movable in order to change the angle of the door against the towing direction. Another pair of chains at the after end of the door fasten to a ring by which it is possible to change the angle of incidence of the door so that it tends to go upwards or downwards in the water. (See diagram)

The shearing effect of the wing door is said to be about twice that of an ordinary trawl door of the same area, while the resistance of the wing door is less than that of the old trawl door. The wing door, unlike the ordinary door, retains its stability while moving through the water and makes practically no noise.

The development of the wing door made possible the design of the one-boat "Phantom" trawl. This can be used near the bottom or for pelagic fishing at any depth between the surface and the bottom. Stability is provided to the net by its symmetrical construction and by the wing doors. For pelagic fishing the trawl has two danlenos with streamlined after sides, which help the doors to open the mouth of the trawl laterally.

(over)

FIVE-BLADE PROPELLER

UNDERWATER CAMERA

NEW NORWEGIAN WHALECATCHER

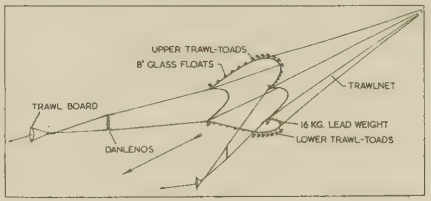
MID-WATER TRAWL

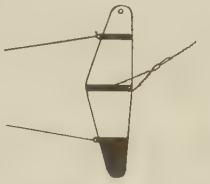
2.116 (Cross Reference: 9.17)

2.1121

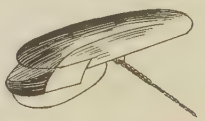
The trawl toads are also important items in the operation of this gear. They are self-stabilizing shearing planes that are attached by single ropes to the headline and also to the footrope. On the footrope the toads act as substitutes for bobbins in controlling the net and protecting it from damage on rough ground. Tickler chains are sometimes used when operating near the bottom.

The "Phantom" trawl is said to have the following advantages over the ordinary trawl: Less towing resistance, which means a saving in fuel or an increased trawling speed; thinner warps and lighter trawl doors and equipment generally, which cuts down costs; trawling will probably be possible on rough ground without using heavy bobbins under the footrope; spawn and small fish are not taken; and there is less chance of damage to the gear.





A wingdoor. The warp is to the right.



Closeup of a trawl toad.

2.117 (Cross Reference: 1.95)

Quarters are provided below deck aft, in the after deckhouse, and in the deckhouse forward of the engine casing. Messes, pantry and galley are all forward.

All modern navigational aids are carried. The master gyro is located below with repeaters on the bridge, in one wing of the bridge and in the chart room.

The wheelhouse, funnel, and the ship's lifeboats are constructed of aluminum alloy.

0.5 THE MICROCOCCI IN A MARINE ENVIRONMENT

Wood, E. J. F. (Marine Biological Laboratory, Cronulla, New South Wales, Australia)
Journal of General Microbiology 6, Nos. 3-4, 205-210 (May, 1952)

Micrococci are normally found in the slime of teleost and elasmobranch fishes. They are present in the early stages of teleost spoilage and in all stages of elasmobranch spoilage. Because they frequently attack urea, peptone, asparagine, aspartic-acid, and alanine, they may play a significant role in elasmobranch spoilage. The micrococci are found at times in abundance in estuarine and marine muds, but they are not commonly found in sea water or on submerged surfaces.

All of the fish examined were demersal; consequently, the organisms that they carried probably came from the mud. The 600 cultures examined came from fish muscle, the surface of living fish, sea water, and estuarine and marine muds. The methods of study used were those recommended in the Manual of Methods published by the Society of American Bacteriologists. Actual reactions studied appear in Table 1 (this card, over).

All strains of micrococci examined grew on sea-water or tap-water agar with optimal growth occurring at 20-30°C. A few strains refused to grow at 37°C.; however, most were heat tolerant and grew above 45°C. The strains examined were nearly always Gram positive. The reactions of the micrococci from marine sources appear in Table 1. They indicate that the strains are of the usual mesophilic type, and not specific to the marine environment from which they came. There was no definite grouping of the strains. Less than 1 percent of the staphylococci failed to ferment at least one sugar. Among the sarcina, however, the proportion of non-fermenters was higher.

The correlation between the eventual grouping of the strains and their sources appears in Table 2. The non-pigmented forms (Staph. candidus) were widely distributed. The lemon-yellow (Staph. luteus, Staph. varians) and orange (Staph. aurantiacus) forms were present mainly on or in fish.

(over)

 ABSTRACTER: Martin Heerdt

0.31 THE BIOSYNTHESIS OF SQUALENE

Langdon, Robert G. and Bloch, Konrad (University of Chicago)
Journal of Biological Chemistry 200, No. 1, 129 (January, 1953)

In 1916 Tsuijimoto isolated from shark liver oil a hydrocarbon having the empirical formula $C_{30}H_{50}$ which he named squalene. Later the structure of this hydrocarbon was established as a dihydrotriterpene by Heilbron and coworkers. This compound has more recently been found to be of rather wide-spread occurrence. It has been reported to occur in yeast, palm oil, human dermoid cysts, and human sebum. However, it has not been known whether squalene is synthesized by animals or whether its ultimate source is ingested plant material.

Rat tissues do not normally contain sufficient squalene to make direct isolation feasible. However, if this hydrocarbon is fed, small amounts can subsequently be recovered from the tissues, indicating that it is absorbed from the gastrointestinal tract. With shark liver squalene as a carrier, synthesis of the hydrocarbon in rat tissues can be demonstrated with the aid of the isotopic tracer technique. Acetate serves as a carbon source in this process.

Experiments were carried out using isotopic tracer techniques and employing rats as experimental animals. The following principal conclusions were drawn from these experiments:

1. When squalene is fed to rats, 5 to 10 percent of the administered hydrocarbon can be recovered from the tissues.

(over)

 Reprinted in part

2.116 ULTRASONIC DEVICE FOR HUNTING WHALES

Anonymous
World Fishing 2, No. 1, 12-14 (January, 1953)

The catchers of two of Great Britain's Antarctic whaling expeditions are equipped with a new electronic whale-hunting aid. The equipment has been tested under operational conditions during the past three whaling seasons in the South Atlantic and it is now considered to be perfected.

The purpose of the whale finder is to decrease the time taken in hunting and to increase the chance of a successful kill. Blue and fin whales, of which most of the catch is composed, usually surface to blow every two or three minutes, though they may sound for considerable periods. Prior to the development of the new device, it was necessary to rely on human judgment to determine any likely changes of course by the submerged whale. The whale finder is claimed to provide continuous information on the whale's position, as to both range and direction, once contact has been made. The catcher can thus close for a shot in the shortest possible time. The device is not intended as a means for locating whales, except perhaps in conditions of poor visibility, and is not employed until a whale has been sighted.

The whale finder consists of an electro-acoustic transducer, or oscillator, mounted in a sound-transparent dome projecting below the keel of the vessel. Ultrasonic pulses transmitted by the transducer in a narrow horizontal beam are reflected back to the ship by any object which they intercept. The returning echoes are amplified and received audibly in headphones and visually on a chart. The device is designed to operate on a lower frequency for use at long and medium ranges and on a higher frequency for short

(over)

 ABSTRACTER: Roy C. Stevens

2.14 ICE FISHING ON THE GREAT LAKES

Anonymous
Fishing Gazette 69, No. 12, 28, 75 (December, 1952)

An estimated 2,000 commercial fishermen fished their nets through Great Lakes ice in 1952. Some netters averaged 1,000 pounds or better daily. Species of fish taken include herring, smelt, whitefish, chub, suckers, pike, perch, and several other varieties.

Success at ice netting requires a knowledge of water currents in the area, of banks where fish lay in wait for food, of spawning areas and of the weather conditions.

To protect nets against loss when ice drifts out or where a breakup occurs, netters use a tripping device that automatically releases nets and allows them to drop to the bottom where they may be recovered later.

One type of gear used is the trap net set. This consists of mesh leaders as long as 1,000 feet leading to a heart-shaped tunnel netting which opens into a crib in which the fish are trapped.

Gill nets are set under the ice by means of a long pole with a rope attached, which is pushed under the ice from hole to hole. When the last hole is reached, a larger rope to which one end of the gill net is attached is pulled through. The holes are cut with a special "ice spud" about 20 inches in diameter.

A large square or oblong hole is cut in the ice for seine netting operations. Pond and trap nets are set in the same manner as the gill nets, but the principal hole in the ice is usually of larger size.

(over)

 ABSTRACTER: Roy C. Stevens

2.116 (Cross Reference: 1.95)

ranges. Alternative pulse lengths and vertical beam widths are also provided to enable contact to be maintained right down to harpoon range.

The transducer is operated from a control panel on the bridge, and its bearing at any instant is indicated by a repeater pointer. A repeater from the ship's gyro automatically holds the transducer in azimuth to the last bearing set by the operator. Thus, once contact with the whale has been established, changes of course do not throw the beam off the target.

Echoes are recorded on a recorder mounted alongside the control panel. The recorder can be operated in five alternative range scales -- 250, 500, 1,000, 1,500, and 2,000 yards. By selecting the scale appropriate to the range of the whale, the full width of the paper can be used to best advantage. Three revolving pens are used to eliminate delay between completion of one trace and the start of the next. The minimum range at which objects in the beam can be identified is 20 yards, and the maximum range, under favorable conditions, is 2,000 yards.

The dome housing the transducer can be retracted into the hull of the ship after the harpoon has been fired, to avoid danger of fouling the harpoon line. It is normally kept retracted when not in use.

2.14

When the weather is below freezing, catches may be held a week without any spoilage. During warm weather, of course, the fish must be disposed of within 24 hours.

0.5 (Cross Reference: 2.01)

Table 1. *Reactions of micrococci from marine sources*

	Species-group					Species-group			
	Staph. candidus	*Staph. aurantiacus*	*Staph. luteus-varians*	*Staph. roseus*	*Staph. flavus*	*Sar. candida*	*Sar. aurantiaca*	*Sar. lutea-citrea*	*Sar. schaudinii*
No. of strains	283	99	124	8	4	18	14	11	4
	Percentage of strains giving positive reactions								
Gelatin liquefied	94	68	85	0	100	5	30	0	25
Reaction of milk:									
Acid	40	15	13	25	75	50	23	0	50
Alkaline	28	44	65	37	0	18	77	100	0
Unchanged	32	39	22	38	[illegible]	34	0	0	50
Nitrates reduced	43	32	48	50	75	44	30	27	0
Acid from:									
Glucose	88	77	50	62	100	83	66	63	100
Lactose	65	90	33	25	50	60	20	18	75
Sucrose	93	55	33	62	100	[illegible]	42	54	100
Maltose	88	77	33	50	100	[illegible]	30	45	75
Mannitol	77	77	33	50	50	72	71	36	100
Galactose	65	90	33	50	50	21	36	27	75
Fructose	80	77	33	75	50	[illegible]	64	27	100

Table 2. *Source of marine cocci*

(Number of strains.)

Species-group	Teleosts	Elasmobrancha	Sea-water	Estuarine mud	Glass plates	Marine mud
Staph. candidus	197	15	11	[illegible]	0	1
Staph. aurantiacus	89	4	0	5	0	2
Staph. luteus	48	0	0	0	0	0
Staph. varians	75	1	0	3	0	0
Intermediate	0	2	1	1	0	0
Staph. flavus	0	4	0	4	0	0
Staph. roseus	0	1	8	4	0	0
Sar. candida	1	0	0	18	–	2
Sar. schaudinii	0	0	0	4	–	0
Sar. ureae	0	0	1	0	–	0
Sar. aurantiaca	1	4	1	9	–	1
Sar. lutea	1	4	0	6	–	0
Sar. citrea	0	0	0	1	–	0

0.31

2. It was demonstrated that squalene is synthesized by the tissues of the rat. Both carbon atoms of acetic acid are utilized in this process.

3. Squalene is a normal constituent of rat liver. It occurs in small concentrations and is regenerated at a rapid rate.

1.2 STRANGE FISH THAT INDIANS USED FOR CANDLES NOW SOUGHT FOR FOOD

Anonymous
Fisherman 20, No. 7, 14, 18 (Late Fall Issue 1952)

The eulachon, a member of the smelt family, was once used only by the Indians. Because of its high oil content, it was found that by threading it with a wick the fish could be used as a candle. For this reason it is also known as the candle fish. Later, a large proportion of the catch was used to feed fur-bearing animals. Today, however, selected, frozen eulachons, attractively packaged, are finding a steady market in the food stores of Canada and the United States.

The eulachon is found from northern California to the Bering Sea. It provides a substantial fishery in British Columbia, the catch for 1952 totalling approximately one million pounds on the Fraser River alone. It is fished from salmon gill-net boats operated by one man, the net being similar to the salmon gill-net but with a smaller mesh. Unlike the technique employed in salmon fishing, eulachons are not taken out of the net as it is hauled aboard. The net and its contents are wound over the net-drum and taken immediately to the landing where the net is taken off and replaced with a fresh net. The fisherman thus returns to the grounds without loss of time.

The fishing season extends from early April to May, coinciding with the eulachon's spawning migration. During the peak of the season about 100 boats are engaged in the fishery. Fishermen received six cents a pound for eulachons during the 1952 season.

(over)

 ABSTRACTER: Roy C. Stevens

4.13 FATTY ACID COMPOSITION OF FISH OILS

Swain, Lyle A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 3-6 (December, 1952)

One of the fatty acids commonly occurring in fish oils has six double bonds and is 50 percent more unsaturated than the most unsaturated fatty acid usually reported as a constituent of vegetable oils. A high degree of unsaturation confers on the oil molecules the property of combining with each other and with the molecules of added substances to produce materials with many industrial possibilities. The author points out that if the high degree of unsaturation uniquely possessed by the fatty acids of some fish oils could be capitalized upon to a greater extent than at present, fish oils would hold a more prominent place among natural oils and fats than they now do.

In the determination of the fatty acid composition of a sample of British Columbia herring oil, the sample was treated to convert the fatty acids into methyl esters. These were dissolved in acetone to make a 10 percent solution, which was then cooled to -13°F. The crystals that separated out were mostly the esters of the saturated fatty acids. The solution remaining was diluted with an equal volume of acetone and cooled to -103°F. The crystals that next separated out consisted of the methyl esters of the saturated fatty acids not previously precipitated and of most of the fatty acids containing one double bond. The solution remaining after the second crystallization contained the esters of the fatty acids having more than one double bond. These made up 38 percent of the sample. The three fractions had iodine values of 9.4, 84.3, and 213.2, respectively.

(over)

 ABSTRACTER: F. Bruce Sanford

4.13 STUDIES ON THE COMPOSITIONS OF FATTY ACIDS OF THE "BLACK COD", ERILEPIS ZONIFER-BODY OIL AND ITS NUTRITIVE VALUE

Kaneda, Takashi
Bulletin of the Japanese Society of Scientific Fisheries 17, Nos. 8-9, 225 (1952)

The black cod (Erilepis zonifer Lockington) is found on the deep-sea bottom off central Japan. The author studied the component fatty acids of this body oil and examined the nutritive value of this oil by rat-feeding.

The results obtained were as follows:

(1) Black cod was rich in oil, especially the abdominal region, which contained 48 percent.

(2) Characteristics of this oil differed from other marine fish oils, i.e. low iodine value, no highly unsaturated acids.

(3) The mixed fatty acids of this oil contained 29.7% of solid acids (Twitchell's lead salt alcohol test), though the lead salt of solid acids was repeatedly washed by alcohol, the iodine value of solid acids showed 51.8.

(4) After several recrystallizations from alcohol the hydroxylated acid, manufactured from solid unsaturated acid by Hazura's method of oxidation, melted at 118° and its molecular weight was 317.57.

(over)

 English summary

4.13 EVOLUTION OF ANIMAL FATS

Shorland, F. B. (Fats Research Laboratory, Wellington, New Zealand)
Nature 170, No. 4335, 924-925 (November, 29, 1952)

Reports from the author's laboratory and from other workers suggest that there is an increasing simplicity of animal fats as one proceeds from the lower to the higher forms of animal life. These findings apparently are largely due to the influence of the diet and only in part to the animals themselves. Aquatic mammals and birds deposit fats that are of a complex aquatic type, whereas land mammals and birds, which feed on fats of relatively simpler composition, deposit simpler types of fats.

The major trend of evolutionary development in fats with respect to the fat metabolism of animals now appears to be as follows:

(a) In the first stages of evolutionary development of fats in animals, the organism, as exemplified by fishes, is able to assimilate the dietary fat and so deposit it in its tissues in the same form except for minor modifications.

(b) In the mid-stage, as exemplified by amphibians, reptiles and most mammals, the animal has acquired an ability to synthesize fat in addition to its ability to deposit dietary fat. These synthetic fats are of uniformly simple composition and contain as their main components, palmitic, stearic, and oleic acids.

(c) In the final stage, the organism, as exemplified by certain ruminants, loses to a large degree the power to deposit dietary fat, the component parts of which are broken down by the bacteria of the rumen before assimilation by the animal. The composition of

(over)

 ABSTRACTER: Martin Heerdt

BRITISH COLUMBIA EULACHON FISHERY

FATTY ACID COMPOSITION OF ERILEPIS ZONIFER

FATTY ACID COMPOSITION OF FISH OILS

EVOLUTION OF ANIMAL FATS

4.13

(5) The saturated acids separated from mixed fatty acids by the method of Bertram were a small proportion of the total acids. (ca. 10%)

(6) The mixed unsaturated acids of this oil consisted mainly of the oleic series, i.e. oleic acid (ca. 55%), C_{20} and C_{22} acid (ca. 45%). The presence of these acids was clearly demonstrated by Hazura's method of oxidation and ozonization.

(7) The nutritive value of black cod body oil was better than that of olive or soybean oils.

4.13 (Cross Reference: 4.91)

the depot fat now consists almost entirely of synthesized fat with palmitic, stearic, and oleic acids as the major constituents.

It therefore follows that the complexity of the fats of the less highly organized animals, such as fishes, is largely due to the fatty-acid composition of the diet. Fish, for example, when fed unusual diets, will deposit fats that are unlike the usual aquatic type. If the dietary fat is similar in fatty acid composition to that of synthesized fat, all groups of animals would deposit fats of a somewhat similar fatty-acid composition. By feeding a fat of different fatty-acid composition as, for example, linseed oil, the differences in the fatty-acid composition of the depot fats would be as follows:

Animals in the first stage of evolutionary development would deposit fats of a fatty acid composition resembling that of linseed oil. Animals in the mid-stage of development would lay down fats consisting of a mixture of synthesized fat and linseed oil; whereas animals in the third stage of development would deposit mostly synthesized fats with almost no evidence of linseed oil.

1.2 (Cross Reference: 1.0111)

The eulachon reaches a length of about nine inches, but those taken in the British Columbia fishery average between seven and eight inches. Most fish of this species spawn in their second or third year. Males predominate throughout most of the run. Each female produces from 17,000 to 40,000 eggs, depending on her size. Deposited on the bottom of the main river, the eggs are anchored there by the adhesive nature of the outer egg.

4.13 (Cross Reference: 4.80)

The fatty acids in the two crystal fractions were those occurring almost universally in the oils of land animals and plants. The fraction remaining in solution contained the fatty acids having a greater amount of unsaturation. These fatty acids are not commonly found other than in fish oils. Consequently, the demand for fish oils would increase if the market for these fatty acids were to expand.

3.26 TRANSPORT AND STORAGE OF PERISHABLES IN CANADA

Lentz, C. P. and Cook, W. H. (National Research Council, Ottawa, Canada)
Refrigerating Engineering 61, No. 2, 160-162 (February, 1953)

Canadian railways began using end bunker refrigerator cars before 1900. These cars have a very serious limitation when used to carry frozen foods, in that temperature variations between different parts of the car may reach as much as 20°F. Research conducted by the Canadian railways during the 1930's showed that the overhead bunker car reduced spatial temperature variations to 2 or 3 °F.

Dry ice was one of the first refrigerants tried for obtaining adequately low temperatures for handling frozen foods. The use of dry ice, however, was abandoned by 1946 because of its high cost and limited availability. The most promising combination of water-ice and salt tested thus far is a mixture of ice, sodium chloride, and ammonium nitrate. This salt combination produces car air temperatures as much as 5°F. lower than the conventional sodium chloride and ice mixture. The ammonium nitrate mixture costs somewhat more than double the cost of ice and salt but can be adapted without any change in existing icing procedure.

Model car tests as well as road tests have shown that the bunker system in existing roof tank cars can be modified to produce even lower temperatures. The changes in design that are necessary to obtain temperatures 5°F. lower than are normally obtained with maximum refrigeration are shown in figure 1. Bunkers in the modified car are somewhat larger, have extended surface in the form of transverse fins, and slope downward toward the longitudinal axis of the car.

One limiting factor in the storage of frozen foods is surface drying, a condition caused by the sublimation of ice at the surface of the product. Frozen fish are usually glazed with a thin coating of ice before going into storage to protect against loss from surface desiccation. One means of improving conditions in the storage room is based on the

(over)

 ABSTRACTER: Martin Heerdt

3.234 A NEW LIQUID MEDIUM FOR FREEZING ROUND FISH

Holston, John A. (Fishery Technological Laboratory, Boston, Massachusetts)
Commercial Fisheries Review 14, No. 12a, 36-40 (December, 1952 - Supplement)

In one phase of a project dealing with the freezing of fish at sea, the Boston Laboratory of the U. S. Fish and Wildlife Service has tested a large number of chemical compounds as possible materials for new liquid freezing media. Experience on the Service's vessel Delaware has indicated that although sodium chloride brine is a good immersion-freezing medium it imposes two limitations on operations of freezing fish at sea: (1) restriction of the freezing operation range from 5° to 10°F. with the concentration of brine used to avoid freezing-out of water or precipitation of salt in the tubes of the heat-exchanger in the refrigerating system, and (2) rises in temperature above the safe maximum (about 10°F.) for negligible penetration of the salt into the meat of the fish when gluts of fish are being frozen.

Of the many materials tested, combinations of sugars with inorganic salts for reasons of cost, availability, and lack of toxicity appeared to be best. Media containing various concentrations of sodium chloride, glucose and sucrose were tried, but the best of these was capable of extending the freezing operation range by only 2°F. while operating 13°F. above the freezing point as a safety factor.

The high solubility of calcium chloride and its extreme range of freezing-point depression (to -59.8°F.) made it a desirable component of a freezing solution. However, as a single component, other than water, of a freezing medium it was found to cause considerable deterioration of the surface membrane of the fish. It was reasoned that the substitution of calcium chloride for sodium chloride in the above mentioned sugar-sodium

(over)

 ABSTRACTER: Roy C. Stevens

0.5 THE SURVIVAL OF RED HALOPHILES IN WATER AND BRINES

Castell, C. H. and Mapplebeck, E. G. (Atlantic Fisheries Experimental Station, Halifax, N.S.)
Journal of the Fisheries Research Board of Canada IX, No. 8, 377-387 (December, 1952)

The effect of the salt concentration on the survival of red halophiles in brines was studied. Cultures used were isolated from salt fish and solar salt. Most of the tests were made with strains #18 and #2 of Pseudomonas salinaria Harrison and Kennedy. A modification of Lockhead's (1934) skim milk-salt agar culture medium was used.

To determine the survival interval of red halophiles in water and various brine solutions, one-liter quantities of these solutions were inoculated with one milliliter of a saline suspension of an actively growing culture containing one billion cells per cubic centimeter. Representative one-milliliter samples were withdrawn from each flask at intervals and transferred to the surface of sterile salt agar medium in Petri dishes. Records of growth at 42°C. were maintained.

To evaluate water and other solutions as sterilizing agents for red halophiles, brine-soaked pieces of unpainted wood (11 x 1 x 0.2 cm. in size) were immersed for 30 minutes in a heavy suspension of the test organism in 16 percent brine. After being contaminated, the pieces of wood were immersed for measured intervals of time in water or the disinfectant solution, removed, shaken to get rid of excess moisture, and then immersed in 1000 ml. of 16 percent sterile brine. After vigorous shaking, 5 serial dilutions were made from the 16 percent brine and 5 ml. transferred from each to the surface of the salt agar medium. The plates were incubated at 42°C. and examined daily for growth of red halophiles.

When protected from direct sunlight and held at 18-25°C., none of the cultures survived for 24 hours in 1 or 5 percent salt solutions. In 10 percent brine, one out of four

(over)

 ABSTRACTER: Martin Heerdt

2.01 STABILITY OF ANTIBIOTICS WHEN USED IN EXPERIMENTALLY RETARDING FISH SPOILAGE

Bissett, H. M. and Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 23-24 (December, 1952)

According to other workers, a slow inactivation of aureomycin takes place when meat containing the antibiotic is stored for several days at 50°F. The possible reasons for the destruction of aureomycin in meat include a natural instability of the antibiotic, breakdown by meat enzymes, destruction by developing spoilage bacteria or yeasts, destruction by heat, and destruction by the presence of nitrite or ascorbic acid. These possibilities were investigated.

Representative samples of fresh minced coho salmon, some with 2 and some with 5 parts per million (p.p.m.) of aureomycin (as aureomycin hydrochloride), were stored at 40°F. for 4 days. Assays to determine the amount of aureomycin present after storage showed no appreciable loss of the antibiotic. Terramycin was equally stable under identical conditions.

When aureomycin was incorporated in minced coho salmon flesh at the rate of 5.1 p.p.m. and the combination was subjected to heat at a temperature of 212°F., a rapid decline in antibiotic potency occurred. Less than 1/2 of the antibiotic remained after 10 minutes and less than 1/10 remained after 30 minutes of heating. Similar results were obtained with terramycin.

(over)

 ABSTRACTER: Martin Heerdt

0.5 (Cross References: 2.01, 3.5)

survived for 24 but not 42 hours; whereas in 15 percent brine, they lived from 20 to 41 days. In 20 percent brine the culture survived for 76 days, and in saturated solutions, for 120 days.

No relationship was found between the so-called optimum growth temperature (37° to 43°C.) and the optimum temperature for survival of the organisms in brines. At 45° the cultures did not survive for 24 hours in 20 percent salt, but as the temperature was reduced the survival time increased for each level of salt concentration.

The addition of one percent protein to the brines gave a marked protective action. Cultures that did not survive for even 24 hours in 10 percent salt solution, lived for 89 days in similar solutions to which one percent blood serum had been added.

Pseudomonas salinaria #18 from the surface of a contaminated piece of wood (11 x 1 x 0.2 cm. in size) in quantities of approximately 10 million cells per milliliter did not survive even 6 hours in tap water, and the first hour alone brought a 99 percent decrease. In tests run simultaneously, the culture survived 4 to 6 times as long in sea water as it did in tap water, but none of the halophiles survived for 24 hours or more in sea water at room temperature.

Ordinary tap water became increasingly effective in its sterilizing action against red halophiles as the temperature was raised. At 70°C. tap water destroyed all of the red halophiles on heavily contaminated wood in less than five minutes. Water at 70°C. was a better disinfectant than one percent hydrochloric acid, two percent lye, 1,000 p.p.m. chlorine, or 5 percent formaldehyde at 20° to 25°C.

In all instances, as the test organisms approached their maximum survival time in the various solutions, the time required to re-establish growth increased markedly when they were transferred to the surface of the salt agar medium.

2.01 (Cross Reference: 3.12)

When aqueous solutions of aureomycin hydrochloride were adjusted to a pH of 6.7, the approximate pH of fish muscle, even a brief exposure to heat was sufficient to cause complete inactivation of the antibiotic. At pH 4.5, the unadjusted pH of aqueous solutions of aureomycin hydrochloride, however, the rate of antibiotic destruction as a result of heating was similar to that encountered in fish flesh. These findings indicate that fish flesh itself was not responsible for the destruction of the antibiotic; in fact, the fish flesh actually appeared to exert a protective effect of its own.

Fish flesh preservatives such as sodium nitrite in quantities of 200 p.p.m. or ascorbic acid in quantities of 40 p.p.m. were found to have no appreciable effect upon the stability of aureomycin in flesh containing 5 p.p.m. of the antibiotic when the samples were stored for 2 days at 40°F.

The effect of bacterial spoilage upon the stability of aureomycin in fish flesh is being investigated.

3.26

use of false walls and floors as shown in figure 2. For existing cold storage rooms, a double false wall and floor can provide a reasonably satisfactory solution to the problem of excessive drying in storage. The use of false walls and floors reduces surface drying by reducing the temperature and the circulation of air in the space adjacent to warm surfaces to values approximating those in other parts of the storage room.

A more complete solution to the problem of excessive drying involves what is called a jacketed cold storage room. At least one cold storage plant of this type is in operation in Canada. Figure 3 shows a diagram of a jacketed room. In operation, air for the removal of heat is circulated through the air space between the insulation and the inside surface of the room. The circulating air completely surrounds the room and, since it does not come in contact with the cooling coil, the room humidity is independent of the coil temperature.

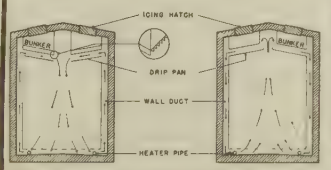


Fig. 1. Comparison of standard (right) and modified overhead ice bunker systems.

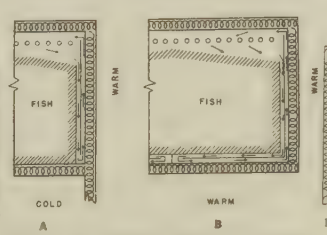


Fig. 2. View of construction showing at A a double false wall in a storage room with one warm wall and at B a double false wall and floor in a room with two warm walls and a warm floor.

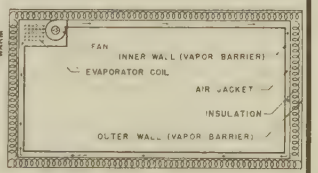


Fig. 3. View showing construction of jacketed storage room.

3.234 (Cross Reference: 2.118)

chloride solution might materially reduce or eliminate the typical calcium chloride surface effect and at the same time result in a medium requiring less glucose, no sucrose, and yet capable of attaining a much lower freezing temperature. All these suppositions were proved to be correct. A further advantage in the use of calcium chloride is that the heat it produces in dissolving, raises the temperature of the liquid and greatly facilitates the subsequent solution of glucose.

It was found that a minimum of one part glucose to one part calcium chloride was necessary to prevent the deteriorative effect of the calcium chloride on the surface membrane of the fish. Increase of the glucose content to or beyond the 1:1 ratio completely eliminated the surface effect.

A solution of 25 percent each (by weight) of calcium chloride and glucose, selected as one meeting the requirements for a medium for use in freezing fish at sea, was found to freeze at a temperature of about -24°F. It was found to have a low viscosity and to be the least expensive. A transparent and durable glaze was formed on fish removed and stored in a plate freezer.

Taste-panel members were unable to distinguish between fish frozen in the glucose-calcium chloride medium and control samples of fish frozen in sodium-chloride brine.

6.190 A STUDY OF THE ROLE OF FISHERY BY-PRODUCTS ON YEAST GROWTH

MacLeod, Robert A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 20-22 (December, 1952)

A factor or factors peculiar to fishery products that can affect the growth of yeasts has been reported. Fishery products are said to stimulate yeasts to utilize inorganic nitrogen salts and urea. It has been inferred that ruminants can also be affected in this manner because fishery products, particularly whale solubles, have been said to be beneficial to domestic cattle and sheep.

To study this effect of fishery products, two samples of whale solubles, one each of herring solubles, stickwater, and enzymatically hydrolyzed halibut muscle were added to a standard yeast assay medium. Saccharomyces cerevisiae, a typical bakers' yeast, and Saccharomyces carlsbergensis 4228, a brewers' yeast, were chosen for the study. Cell yield was determined rather than inorganic or urea nitrogen utilization inasmuch as increased utilization of these products would ordinarily result in an increased yield of cells.

Since the basal medium supports the growth of yeasts, an unknown growth factor could increase the speed of attainment of maximum growth or affect the extent of growth of the organisms. Thus cell yield was determined after 24 hours incubation and by permitting growth to reach a maximum by incubating 45 to 48 hours. Results of the assay are given in Table I. The accuracy of the method is not much better than ±10 percent.

A number of natural materials, fishery and otherwise, increased the growth of S. carlsbergensis. Since further addition of vitamins did not produce a growth response equivalent to that elicited by other supplements, the stimulation was probably not the result of a deficiency of essential vitamins. When S. cerevisiae was used as the test organism, fishery materials stimulated even less than with S. carlsbergensis. This is evidence that the fishery products, in common with other natural materials, contain one or more substances able to influence the growth of at least one yeast, S. carlsbergensis to some small extent.

(over)

 ABSTRACTER: Neva L. Karrick

6.190 FEEDING FISH MEALS AND SOLUBLES TO CHICKENS DOES NOT AFFECT FLAVOR OF MEAT -- TECHNICAL NOTE NO. 23

Nilson, Hugo W. (U. S. Fish and Wildlife Service, College Park, Maryland)
Commercial Fisheries Review 14, No. 12a, 41 (December, 1952 - Supplement)

Previous tests conducted at the Fishery Technological Laboratory at College Park, Maryland, have shown that feeding chickens, turkeys, and ducks diets containing as much as 30-percent fish meal did not cause off-flavors in the meat. No previous work had been done with condensed fish solubles.

Early in February, 15 white Leghorn chicks (which had been on a four-week assay of the vitamin B_{12} content of various condensed fish solubles) were fed the following diet: About 10 percent menhaden fish meal, 13 percent condensed menhaden fish solubles, 7 percent alfalfa meal, and 70 percent ground yellow corn meal (percentages all based on weight). This is not a diet to be recommended for raising chickens, but it should permit evaluating the fishery products in respect to producing off-flavors in the meat.

After feeding this diet to the birds 4 to 8 weeks, they were butchered and dressed. The dressed birds were distributed to various staff members for cooking and taste-testing. This method was used because each individual could prepare the birds according to his favorite recipe. The tester would thus be familiar with the desirable flavor expected and could more easily detect any off-flavors. Only one person thought he could detect a fishy flavor but he was not sure of it. The others reported the flavor and texture of the meat to be excellent.

(over)

 ABSTRACTER: Hugo W. Nilson

6.195 EFFECT OF METHIONINE ON THE FEED EFFICIENCY OF CHICKS

Saxena, Harish and McGinnis, James (The State College of Washington, Pullman, Washington)
Poultry Science 31, No. 5, 934 (September, 1952)

A feeding trial was conducted to observe the growth and feed efficiency of New Hampshire chicks from day of age to eight weeks when low levels of methionine were added to an all-vegetable diet and to diets containing 2.5 and 5.0 percent fish meal. Methionine was added to each of these three basal diets at levels of 0, 0.025, 0.0375, and 0.05 percent. Each of these twelve experimental diets was fed to two pens of 56 unsexed chicks. On all levels of methionine, the chicks receiving 5 percent fish meal averaged 1030 grams; those fed 2.5 percent fish meal averaged 984 grams, whereas birds fed no fish meal averaged 958 grams. Methionine did not improve growth of chicks fed the different basal diets. There was, however, a highly significant increase in feed efficiency when methionine was added to the ration. Feed efficiency on all diets with no supplementary methionine averaged 2.84 as compared to 2.54 on diets containing 0.05 percent added methionine. The increase in feed effiency was most marked when fish meal was present in the diet.

 Reprinted in whole

6.132 FISH MEAL FROM FRESHWATER FISH AND FISH PROCESSING WASTES

Schmidt, P. J. and Lantz, A. W. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 18-19 (December, 1952)

The authors conducted another in a series of experiments designed to provide economical means of producing press cakes from small quantities of non-commercial fish or fish processing wastes. The process used was one of cooking the fish in water, pressing it into firm cakes for the removal of some of the oil and water, and drying either in air or in a dryer.

In the present experiment raw fish was cooked for 15 minutes in water at 175°F. Overcooking was avoided so that the flesh would not crumble. To guard against spoilage of the press cakes from undercooking, the flesh around the head area behind the gills was given special attention. After the cooked flesh had been allowed to drain, and while still hot, it was weighed into 13-pound lots, placed in the curb of a 20-ton hydraulic press, and pressed. Upon removal from the press, each cake was weighed and placed in a tunnel dryer.

Drying conditions were adjusted to a temperature of 85°F., a relative humidity of 26 ± 2 percent, and an air velocity of 230 feet per minute (2.6 miles per hour), approximating atmospheric conditions in the Central Canadian Provinces during the summer months. Cakes made from whole cooked and pressed tullibee required 120 hours to reach a 12 percent moisture content and 167.5 hours to reach an 8.3 percent or equilibrium moisture content.

A 20.3 percent yield of fish meal having 12 percent moisture was obtained when tullibee was used as the raw material. The same tullibee meal on analysis showed 61.8 percent

(over)

 ABSTRACTER: Martin Heerdt

EFFECT OF FISHERY PRODUCTS ON YEAST GROWTH

METHIONINE AND FEED EFFICIENCY IN CHICKS

MEAT FLAVOR OF CHICKENS FED FISH MEAL

FISH MEAL FROM FRESH-WATER FISH

6.132

protein, 14.2 percent oil, and 12.7 percent mineral residue.

When the rate of drying of the press cakes was plotted against time, the air temperature appeared to be the limiting factor. In this particular series of experiments, best drying results were obtained with cakes not over 3/4-inch in thickness. Press cakes from oily fish required a longer drying time than cakes from non-oily fish. Spoiled fish produced a paste-like material on cooking and tended to form emulsions so that pressing became extremely difficult.

6.190

Since acid-hydrolyzed casein produced a growth response, the effect of an amino acid mixture was studied and gave almost the same response as the hydrolyzed casein.

These results do not confirm the report that a growth factor peculiar to fishery products affects the growth of yeasts. The discrepancies may be due to a difference in the strains of yeast used. However, if the phenomenon cannot be reproduced in organisms so closely related as different strains of yeasts, then it is difficult without direct experimental evidence to justify the conclusion that fishery products will stimulate such a widely different group of organisms (few if any of which are yeasts) found in the rumen.

TABLE I.—The effect of various supplements on the growth of two species of yeasts.

Supplement*	Growth† of *S. carlsbergensis*		Growth† of *S. cerevisiae*	
	Incubation time (hours)			
	24	48	24	48
1. None	100	100	100	100
2. Whale solubles (local)	105	110	96	98
3. Whale solubles (South Polar)	115	112	98	98
4. Stickwater	113	112	101	103
5 Herring solubles	56	110	95	110
6. Halibut muscle hydrolysate	109	117	108	116
7. Yeast extract	111	115	99	96
8. Enzymatically hydrolyzed casein	103	116	105	106
9 Acid-hydrolyzed casein	101	114	102	106
10 Vitamin mixture	95	106	98	101

* Except for items 9 and 10 supplements were added in amounts calculated to supply approximately 50 mg. of solids to each flask. Items 9 and 10 were added in amounts equal to those present in the basal medium.

† Expressed as percentage of growth in the unsupplemented basal medium, the composition of which (in amounts per 10-ml. flask) was: glucose, 500 mg.; $(NH_4)_2SO_4$, 35 mg.; KH_2PO_4, 5.5 mg.; $MgSO_4.7H_2O$, 4.25 mg.; $CaCl_2.2H_2O$, 1.25 mg.; $FeCl_2.6H_2O$, 0.025 mg.; $MnSO_4.4H_2O$, 0.025 mg.; potassium citrate, 50 mg.; citric acid, 10 mg.; HCl-hydrolyzed casein equivalent to 85 mg. of original casein; asparagine, 2 mg.; tryptophan, 2 mg.; cystine, 2 mg; thiamin, 10 gamma; inositol, 500 gamma; biotin, 0.5 gamma; calcium pantothenate, 50 gamma, pyridoxine, 10 gamma; nicotinic acid, 10 gamma.

6.190

On May 7, 16 white Leghorn chicks (which had been on a five-week test to determine the nutritive value of the protein of a series of fish meals and condensed fish solubles) were fed the following diet: About 20 percent condensed menhaden solubles, 3 percent alfalfa meal, 1 percent cod-liver oil, and 76 percent ground yellow corn meal (percentages all based on weight). Growth was rather slow, otherwise the birds seemed to fatten nicely. Between June 1 and June 30, the birds were butchered and dressed, and distributed to the various testers who again cooked and prepared the birds according to their favorite recipes. All of the people reported the flavor and texture of the meat to be excellent.

These short-time studies indicate that the meals and condensed fish solubles which were tested (all of them were low in oil) did not produce any distinct off-flavors in the meat of chickens.

0.31 THE UTILIZATION OF SQUALENE IN THE BIOSYNTHESIS OF CHOLESTEROL

Langdon, Robert G. and Bloch, Konrad (University of Chicago)
Journal of Biological Chemistry 200, No. 1, 135 (January, 1953)

0.31 SYNTHETIC C^{14}-"SQUALENE": CONCERNING ITS INCORPORATION INTO CHOLESTEROL BY LIVER

Tomkins, G. M.; Chaikoff, I. L.; Dauben, W. G.; Bradlow, H. L.; and Srere, P. A.
Journal of the American Chemical Society 74, No. 23, 6145 (December 5, 1952)

0.32 THE WATER TRANSFER IN CODFISH MUSCLE IMMERSED IN SODIUM CHLORIDE SOLUTIONS

Fougere, H.
Journal of the Fisheries Research Board of Canada 9, No. 8, 388-392 (December, 1952)

(Abstract of this article appears under 3.5 page 7)

0.32 SYNTHETIC AMINO ACIDS IN FEEDS

Johnson, Julius E.
Proceedings of the Fifth California Animal Industry Conference, Sacramento, California, October 23-24, 1952, p. 54

0.33 THE AMADORI REARRANGEMENT UNDER NEW CONDITIONS AND ITS SIGNIFICANCE FOR NON-ENZYMATIC BROWNING REACTIONS

Hodge, John E. and Rist, Carl E.
Journal of the American Chemical Society 75, No. 2, 316 (January 20, 1953)

0.38 GLUCOSULPHATASE ACTIVITY IN MARINE MOLLUSCS

Dodgson, K. S. and Spencer, B. (Physiology Institute, Newport Road, Cardiff)
Biochemical Journal 53, No. 1, iv (January, 1953)

In certain tropical marine molluscs a sulphatase exists capable of liberating sulphuric acid from glucose-6-monosulphate. The large periwinkle (Littorina littorea) occurring in British waters possesses appreciable glucosulphatase activity.

0.38 STUDIES ON MYOSIN-ADENOSINETRIPHOSPHATASE

Gergely, J.
Journal of Biological Chemistry 200, No. 2, 543 (February, 1953)

0.6 PROGRESS ON TECHNOLOGICAL RESEARCH PROJECTS OF THE SERVICE'S BRANCH OF COMMERCIAL FISHERIES, 1951-52

Anonymous
Commercial Fisheries Review 14, No. 12a, 1-7 (December, 1952)

0.6 FOOD

Matchett, John R. and von Loesecke, Harry W. (U. S. Department of Agriculture, Washington, D. C.)
Analytical Chemistry 25, No. 1, 24 (January, 1953)

A sequel to the review of methods of food analyses for the period of December 1950 to November 1951. 206 references are cited.

0.7 NUTRITIONAL EVALUATION OF FOOD PROTEINS BY MEASURING AVAILABILITY OF AMINO ACIDS TO MICROORGANISMS I. COTTONSEED PROTEINS

Horn, Millard J.; Blum, Amos E.; Womack, Madelyn; and Gersdorff, Charles E. F. (Bureau of Human Nutrition and Home Economics, U. S. Dept. of Agriculture, Washington, D. C.)
Journal of Nutrition 48, No. 2, 231-241 (October 10, 1952)

0.7 ANTIBIOTICS IN FEEDS

Whitlock, G. P.
Proceedings of the Fifth California Animal Industry Conference, Sacramento, California, October 23-24, 1952, p. 20

0.7 THREE DECADES OF ANIMAL NUTRITION

Russell, Walter C.
Proceedings of the Fifth California Animal Industry Conference, Sacramento, California, October 23-24, 1952, p. 5

1.0111 STRANGE FISH THAT INDIANS USED FOR CANDLES NOW SOUGHT FOR FOOD

Anonymous
Fisherman 20, No. 7, 14, 18 (Late Fall Issue, 1952)

(Abstract of this article appears under 1.2 page 15)

1.0146 BRITISH BRISLING AND SILD SARDINE CANNING

Anonymous
Food Manufacture XXVII, No. 12, 475-480 (December 1, 1952)

(Abstract of this article appears under 3.33 page 3)

1.015 RECENT FISHERIES DEVELOPMENTS IN ASIA, THE FAR EAST AND OCEANIA

Gerhardsen, G. M.
FAO Fisheries Bulletin 5, No. 3-4 (May/June - July/August, 1952)

1.019 FRESHWATER VERTEBRATES OF THE ARCTIC AND SUBARCTIC

Wynne-Edwards, V. C.
Fisheries Research Board of Canada, Ottawa, Bulletin 94 (1952)

1.1 THE JACK MACKEREL, TRACHURUS SYMMETRICUS: A REVIEW OF THE CALIFORNIA FISHERY AND OF CURRENT BIOLOGICAL KNOWLEDGE

Roedel, Phil M. (Bureau of Marine Fisheries, California Department of Fish and Game)
California Fish and Game 39, No. 1, 45 (January, 1953)

1.2 BRITISH BRISLING AND SILD SARDINE CANNING

Anonymous
Food Manufacture XXVII, No. 12, 475-480 (December 1, 1952)

(Abstract of this article appears under 3.33 page 3)

1.4 FREEZING AND COLD STORAGE OF PACIFIC NORTHWEST FISH AND SHELLFISH. I. STORAGE LIFE OF VARIOUS SPECIES OF ROCKFISH FILLETS

Miyauchi, D. T. and Stansby, M. E.
Commercial Fisheries Review 14, No. 12a, 24-28 (December, 1952 - Supplement)

(Abstract of this article appears under 3.249 page 1)

1.5 LIPIDES OF PYLORIC CAECA OF COD (GADUS MACROCEPHALUS TILESIUS)

Hirao, Shuichi and Kinumaki, Toyosuke
Bulletin of the Japanese Society of Scientific Fisheries 17, No. 8-9, 242 (1952)

(Abstract of this article appears under 4.1 page 7)

1.81 HINTS FOR SUCCESSFUL OYSTER CULTURE

Nelson, Thurlow C.
Atlantic Fisherman 33, No. 10, 18 (December, 1952)

1.85 AND NOW IT'S SHRIMP DRIVE-INS

Toney, Tom
Seafood Business 5, No. 4, 18 (November, 1952)

1.86 THE LIFE OF THE COMMERCIAL CRAB

Butler T. H. (Pacific Biological Station, Nanaimo, B. C.)
Western Fisheries 45, No. 4, 12 (January, 1953)

1.87 ROCK LOBSTER CANNING

le Roux, G. J. and v. d. Merwe, R. P.
Fishing Industry Research Institute, Fifth Annual Report (1952), 10-13

(Abstract of this article appears under 3.33 page 1)

1.87 FREEZING OF ROCK LOBSTER

v. d. Merwe, R. P. and le Roux, G. J.
Fishing Industry Research Institute, Fifth Annual Report (1952), 10

(Abstract of this article appears under 3.238 page 1)

1.95 POWERFUL NORWEGIAN WHALECATCHER

Anonymous
World Fishing 1, No. 9, 327-328 (December, 1952)

(Abstract of this article appears under 2.117 page 11)

1.95 ULTRASONIC DEVICE FOR HUNTING WHALES

Anonymous
World Fishing 2, No. 1, 12-14 (January, 1953)

(Abstract of this article appears under 2.116 page 13)

1.95 WHALE MEAT

Kondrup, Mogens
FAO Fisheries Bulletin 5, No. 5, 184 (September-October, 1952)

2.01 THE SURVIVAL OF RED HALOPHILES IN WATER AND IN BRINES

Castell, C. H. and Mapplebeck, E. G.
Journal of the Fisheries Research Board of Canada IX, No. 8, 377-387 (December, 1952)

(Abstract of this article appears under 0.5 page 17)

2.01 THE MICROCOCCI IN A MARINE ENVIRONMENT

Wood, E. J. Ferguson
Journal of General Microbiology 6, Nos. 3-4, 205-210 (May, 1952)

(Abstract of this article appears under 0.5 page 13)

2.02 EFFECT OF THE "MARSH FACTOR" ON THE SHORTENING OF MUSCLE FIBRE MODELS IN THE PRESENCE OF ADENOSINE TRIPHOSPHATE

Bendall, J. R. (University of Cambridge)
Nature 170, No. 4338, 1058 (December 20, 1952)

2.02 STUDIES ON pH OF FISH MUSCLE: VARIATION IN pH OF FRESH ALBACORE MUSCLE ON THE LOCALITY EXAMINED

Kawabata, Toshiharu; Fujimaki, Masao; Amano, Keishi; and Tomiya, Fumiko
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 3, 124 (1952)
(In Japanese with English summary, figures and tables)

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Atlantic Fisherman
Australian Journal of Marine and Freshwater Research
Biochemical Journal
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemistry and Industry
Commercial Fisheries Review
Commercial Fisherman
Drug and Cosmetic Industry
Federation Proceedings
Feedstuffs
Fish Meal and Oil Industry
Fisheries Bulletin (FAO)
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishermen's News
Fishing Gazette
Flour and Feed
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Foreign Commerce Weekly
Frosted Food Field
Gourmet
Ice and Refrigeration
Industrial and Engineering Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Home Economics
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
Modern Sanitation
National Provisioner
Nature
Nutrition Reviews
Oil, Paint and Drug Reporter
Pacific Fisherman
Pan-American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Seafood Business
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Canner and Packer
Western Fisheries
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

2.03 STUDIES ON THE ENZYMES OF SKIPJACK, KATSUWONUS VAGANS, ENTRAILS -- I. ON THE SEASONAL VARIATION OF PROTEOLYTIC ENZYME ACTIVITY IN PYLORIC CAECA

Bulletin of the Japanese Society of Scientific Fisheries 18, No. 4, 151 (1952)
(In Japanese with English summary, table and figure)

2.111 XI. INVESTIGATION ON THE PRACTICAL VALUE OF KNOTLESS NETS

Murayam, Toshizo; Oishi, Yasunori; and Okura, Shiro
Journal of Fisheries Research Institute (Tokyo, Japan), No. 3, 98 (December, 1950)

2.1121 OBSERVATIONS ON USE OF TRAWLING WIRE ON GEORGES BANK

Anonymous
Atlantic Fisherman 33, No. 10, 17 (December, 1952)

2.113 MARINE FOULING AND ITS PREVENTION

Woods Hole Oceanographic Institute
Chemical and Engineering News 31, No. 5, 460 (February 2, 1953)

2.114 COOLING BY CIRCULATION OF FRESHWATER IN FISH CUTTER OPERATION

Meschkat, A. and Hauptmann, E.
Fischereiwelt 3, 47 and 99 (1951)

2.115 DESIGN AND OPERATION OF THE SMALLER FISHING VESSELS

Brammall, A.
World Fishing 1, No. 8, 275 (November, 1952)

2.116 UNDERWATER TELEVISION IN FISHERIES RESEARCH

Anonymous
Trade News 5, No. 5, 5 (November, 1952)

2.116 WOODS HOLE MEN PHOTOGRAPH OCEAN FLOOR OFF NANTUCKET SHOALS

Anonymous
Maine Coast Fisherman 7, No. 7, 21 (February, 1953)

Reproduction of bottom photographs are included along with pictures of the equipment.

2.14 STUDIES ON THE ECOLOGY OF THE NEW ZEALAND FRESHWATER EELS I. THE DESIGN AND USE OF AN ELECTRIC FISHING MACHINE

Burnet, A. M. R.
Australian Journal of Marine and Freshwater Research 3, No. 2, 111 (October, 1952)

2.14 X. THE AVAILABILITY OF FISH ATTRACTION LAMP IN THE VARIOUS FISHERIES

Murayama, Toshizo and Oishi, Yasunori
Journal of Fisheries Research Institue (Tokyo, Japan), No. 3, 90 (December, 1950)

2.118 A NEW LIQUID MEDIUM FOR FREEZING ROUND FISH -- TECHNICAL NOTE NO. 22

Holston, John A.
Commercial Fisheries Review 14, No. 12a, 36-40 (December, 1952 - Supplement)

(Abstract of this article appears under 3.234 page 17)

2.6 A REFRIGERATED DISPLAY CABINET FOR FISHERY PRODUCTS

Anonymous
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 25 (December, 1952)

3.12 STABILITY OF ANTIBIOTICS WHEN USED IN EXPERIMENTALLY RETARDING FISH SPOILAGE

Bissett, H. M. and Tarr, H. L. A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 23-24 (December, 1952)

(Abstract of this article appears under 2.01 page 17)

3.18 MOLD RESISTING PAINTS

Owen, Lloyd A.
Modern Sanitation 5, No. 1, 33 (January, 1953)

3.19 EFFECTS OF HIGH INTENSITY ELECTRON BURSTS UPON VARIOUS VEGETABLE AND FISH OILS

Astrack, A.; Sorbye, O.; Brasch, A.; and Huber, W.
Food Research 17, No. 6, 571-583 (November-December, 1952)

(Abstract of this article appears under 4.20 page 3)

3.19 FACTS ABOUT COLD STERILIZATION

Urbain, W. M.
Food Engineering 25, No. 2, 45 (February, 1953)

3.231 THE USE OF AERATED CONCRETE FOR COLD STORAGE INSULATION

Evans, H. E.
Modern Refrigeration 55, No. 657, 401 (December, 1952)

3.249 DETERIORATION IN FROZEN PORK AS RELATED TO FAT COMPOSITION AND STORAGE TREATMENTS

Palmer, A. Z.; Brady, D. E.; Naumann, H. D.; and Tucker, L. N. (University of Missouri)
Food Technology 7, No. 2, 90 (February, 1953)

The keeping quality of frozen ground pork declined with a decrease in the saturation of pork fat. This deterioration was most marked at temperatures about 0°F. (-18°C.) and when packaged in inferior oxygen-moisture vapor barrier materials.

3.249 FREEZING OF ROCK LOBSTER

v. d. Merwe, R. P. and le Roux, G. J.
Fishing Industry Research Institute, Fifth Annual Report (1952), 10

(Abstract of this article appears under 3.238 page 1)

3.30 PACE-SETTING FISH CANNERY

Joseph, James
Food Engineering 25, No. 2, 81 (February, 1953)

Eight pictures and a flow sheet of the process are included.

3.33 FAST END-OVER-END RETORTING

Anonymous
Food Engineering 25, No. 2, 70 (February, 1953)

3.33 CONTROLS OPTIMIZE CANNING

Slater, Lloyd E.
Food Engineering 25, No. 2, 85 (February, 1953)

3.5 THE SURVIVAL OF RED HALOPHILES IN WATER AND IN BRINES

Castell, C. H. and Mapplebeck, E. G.
Journal of the Fisheries Research Board of Canada IX, No. 8, 377-387 (December, 1952)

(Abstract of this article appears under 0.5 page 17)

3.7 SALTING AND DRYING OF STOCKFISH

Rosenbrock, W.; Rowan, A. N.; Jackson, J.; and Huber, W.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952), 8-9

(Abstract of this article appears under 3.5 page 3)

4.5 EFFECTS OF HIGH INTENSITY ELECTRON BURSTS UPON VARIOUS VEGETABLE AND FISH OILS

Astrack, A.; Sorbye, O.; Brasch, A.; and Huber, W.
Food Research 17, No. 6, 571-583 (November-December, 1952)

(Abstract of this article appears under 4.20 page 3)

4.80 COMMENTARY ON DRYING OILS

Jordan, L. A. (Paint Research Station, Teddington, Middlesex)
Chemistry and Industry, No. 50, 1208 (December 13, 1952)

4.80 FATTY ACID COMPOSITION OF FISH OILS

Swain, Lyle A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 93, 3-6 (December, 1952)

(Abstract of this article appears under 4.13 page 15)

4.91 EVOLUTION OF ANIMAL FATS

Shorland, F. C.
Nature 170, No. 4335, 924-925 (November 29, 1952)

(Abstract of this article appears under 4.13 page 15)

6.134 LOSS OF B-VITAMINS DURING THE PRODUCTION OF MEAL

Anonymous
Meldinger fra S.S.F., No. 7, 129-133 (November, 1952)

(Abstract of this article appears under 6.132 page 5)

6.137 LOW-TEMPERATURE SOLVENT FRACTIONATION OF ANIMAL FATS. PART I. EVALUATION OF ANHYDROUS SOLVENTS FOR CRYSTALLIZATION OF WHITE GREASE

Cording, James Jr.; Willard, Miles J. Jr.; Edward, Paul W.; and Eskew, Roderick K.
(Eastern Regional Research Laboratory, Philadelphia, Pa.)
Journal of the American Oil Chemists' Society 30, No. 2, 66 (February, 1953)

6.137 FRACTIONAL DISTILLATION OF FATTY ACIDS

Potts, R. H. and White, F. C.
Journal of the American Oil Chemists' Society 30, No. 2, 49 (February, 1953)

6.139 FISH MEAL

Lewis, A. M.; Stander, G. M.; Plumbridge, N.; and Davies, W. G.
Fishing Industry Research Institute (South Africa), Fifth Annual Report (1952), 16-18

(Abstract of this article appears under 6.132 page 9)

INDEX

(Continued)

Subject	Page No.	Card No.
Oysters		
Oyster culture	23	1.81
Preserved fish, miscellaneous		
Cold sterilization	25	3.19
Preservatives and sanitation		
Mold resisting paints	25	3.18
Rancidity		
Effect of radiation on fish oils	3	4.20
Rockfish and rosefish		
Cold storage life of rockfish	1	3.249
Salt fish		
Salted and dried stockfish	3	3.5
Water transfer in codfish muscle in brine	7	3.5
Survival of red halophiles	17	0.5
Sardines		
Sardine canning in Great Britain	3	3.33
Shrimp		
Shrimp drive-ins	23	1.85
Spoilage		
Marine micrococci	13	0.5
Survival of red halophiles	17	0.5
Stability of antibiotics in fish	17	2.01
Transportation		
Transport and storage of perishables	17	3.26
Vitamins, B-complex, miscellaneous		
Loss of B vitamins during meal processing	5	6.132
Vitamins, vitamin B_{12} and animal protein factor		
Unidentified growth factor in fish meal	9	6.193
Vitamin B_{12} activity in human serum	9	7.641
Vessels, fishing		
New Norwegian whalecatcher	11	2.117
Prevention of marine fouling	25	2.113
Fishing vessel design	25	2.115
Whales and other marine mammals		
New Norwegian whalecatcher	11	2.117
Ultrasonic whale finder	13	2.116
Whale meat	23	1.95
Properties of whale oils	29	8.7
World fisheries and miscellaneous oceanic fisheries		
Freshwater vertebrates of the Arctic	21	1.019

6.190 FISH MEAL

Holder, Ralph C. (Technical Consultant, National Fisheries Institute, Washington, D. C.)
Nutrition Council of the American Feed Manufacturers Association (December 1, 1952)

6.195 A DIFFERENCE IN IN VITRO PANCREATIC DIGESTION BETWEEN ANIMAL AND PLANT PROTEIN FEEDS

Bondi, A. and Birk, Yehudith (Agricultural Research Station, Rehovot)
Nature 170, No. 4329, 673 (October 18, 1952)

6.23 THE CHAYEN PROCESS FOR EXTRACTION OF OILS AND FATS

Coulson, J. M.
Nature 170, No. 4334, 881 (November 22, 1952)
Food Processing 14, No. 1, 64 (January, 1953)

(Abstract of this article appears under 6.133 page 5)

6.3 STUDIES ON THE PREPARATION OF AGAR-AGAR FROM GRACILARIA CONFERVOIDES (PART 5) REPORT ON THE INDUSTRIALIZATION FOR MANUFACTURING CRUDE AGAR FROM GR. CONF.

Kojima, Yoshio; Kusakabe, Juro; and Funaki, Koemon
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 6, 245 (1952)
(In Japanese with English summary, figures and tables)

7.42 POLAROGRAPHY OF INORGANIC SUBSTANCES IN MARINE ANIMALS. I. SEPARATION AND DETERMINATION OF COBALT

Miyahara, Shojiro
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 6, 273 (1952)
(In Japanese with English summary, tables, and figures)

7.43 HUMIDITY PROCEDURE FOR DETERMINATION OF MOISTURE EQUILIBRIA OF FOOD PRODUCTS

Anonymous
Modern Packaging 26, No. 5, 133 (January, 1953)

7.611 A "DIFFERENCE" FORMULA FOR THE MORTON-STUBBS CORRECTION OF VITAMIN-A ABSORPTION CURVES

Prokhovnik, S. J.
Analyst 77, No. 913, 185-187 (April, 1952)

The application of the Morton-Stubbs correction geometrically shows that the precision of corrected values depends on the precision of differences between the readings at 328 mμ and the two fixation points. The usual Morton-Stubbs formula can be written in terms of these differences; the use of this modified formula has the advantages that the arithmetic is simpler and quicker and may be carried out with an ordinary slide rule and that the cause of poor duplication is more easily detected and possible experimental errors indicated in this way can be checked.

8.51 AMINO ACID CONTENT OF DEHYDRATED GIANT AFRICAN SNAILS (ACHATINA FULICA BOWDICH)

Mead, Albert R. and Kemmerer, Arthur R. (Department of Zoology and Department of Nutrition, University of Arizona)
Science 117, No. 3032, 138 (February 6, 1953)

8.51 STUDIES ON MUSCLE OF AQUATIC ANIMALS. 12. DISTRIBUTION OF EXTRACTIVE NITROGENS IN MUSCLE OF SQUIDS

Simizu, Wataru and Takeda, Masahiko
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 6, 233 (1952)
(In Japanese with English summary and tables)

8.7 STUDIES ON THE WHALE OIL. IV. PROPERTIES OF OILS CONTAINED IN VARIOUS PARTS OF A WHALE BODY (PART 4) ON THE BOTTLE-NOSE WHALE

Saiki, Masamichi and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 6, 269 (1952)
(In Japanese with English summary and tables)

8.8 CHEMICAL STUDIES ON THE SUBSTANCES OF FISH SMELL -- OXIDATION PRODUCTS OF PIPERIDINE

Yamanishi, Tei and Obata, Yataro
Bulletin of the Japanese Society of Scientific Fisheries 18, No. 3, 102 (1952)
(In Japanese with English abstract)

9.12 STUDYING THE EGGS AND YOUNG OF FISH

Simpson, A. C.
World Fishing 1, No. 8, 283 (November, 1952)

9.15 FLORIDA'S RED TIDE TREATED WITH COPPER SULPHATE

Anonymous
Atlantic Fisherman 33, No. 11, 23 (December, 1952)

9.17 UNDERWATER CAMERA USED TO PHOTOGRAPH OYSTERS

Anonymous
Atlantic Fisherman 33, No. 11, 16 (December, 1952)

(Abstract of this article appears under 2.116 page 11)

9.2 FISHERIES REPORT FOR THE YEAR 1951 (DENMARK)

Anonymous
Fiskeri-Beretning For Aret 1951, Fiskeriministeriet, Copenhagen, Denmark, 210 pp.

(Abstract of this article appears under 1.0142 page 7)

INT.-DUP. SEC., WASH., D.C. 37451

INDEX

Subject	Page No.	Card No.
Analysis, inorganic		
Determination of cobalt	29	7.42
Analysis, moisture		
Determination of moisture	29	7.43
Analysis, vitamins, vitamin A		
Correction of vitamin A absorption curves	29	7.611
Analysis, vitamins, B-complex vitamins		
Vitamin B_{12} activity in human serum	9	7.641
Asiatic fisheries		
Fisheries developments in Asia and Oceania	21	1.015
Canned fish, general		
New tuna cannery	27	3.30
Canned fish, processing		
Canning rock lobsters	1	3.33
Sardine canning in Great Britain	3	3.33
End-over-end retorting	27	3.33
Controls in canning	27	3.33
Chemistry and biochemistry, miscellaneous		
Biosynthesis of squalene	13	0.31
Squalene in cholesterol biosynthesis	21	0.31
Browning reactions	21	0.33
Glucosulphatase activity in marine molluscs	21	0.38
Myosin and adenosinetriphosphatase	21	0.38
Cod family		
Lipids of the pyloric caeca of cod	7	4.1
Composition, organic		
Lipids of the pyloric caeca of cod	7	4.1
Fatty acid composition of *Erilepis zonifer*	15	4.13
Fatty acid composition of fish oils	15	4.13
Amino acid content of African snails	29	8.51
Extractive nitrogen in squid muscle	29	8.51
Substances responsible for fish odors	29	8.8
Crab		
Biology of the Dungeness crab	23	1.86
Dried and dehydrated fish		
Salted and dried stockfish	3	3.5
Economics and statistics		
Report of the Danish fisheries for 1950	7	1.0142
Equipment, fishing vessel		
Modern methods of fish detection	7	2.116
Five-blade propeller	11	2.114
Underwater camera	11	2.116
Ultrasonic whale finder	13	2.116
Underwater television	25	2.116
Underwater photography	25	2.116
European fisheries, Scandinavia		
Report of the Danish fisheries for 1950	7	1.0142
European fisheries, United Kingdom and Eire		
Sardine canning in Great Britain	3	3.33
Factory ships		
New liquid freezing medium for round fish	17	3.234
Fish meal, nutritive value		
Amino acid requirements of poultry	5	6.195
Values of proteins in fish meals	5	6.195
Spontaneous heating in fish meal	9	6.132
Chick growth factor in fish solubles	9	6.192
Unidentified growth factor in fish meal	9	6.193
Meat flavor of chickens fed fish meal	19	6.190
Effect of fishery products on yeast growth	19	6.190
Methionine and feed efficiency in chicks	19	6.195
Fish meal and oil, manufacture		
Loss of B-vitamins during meal processing	5	6.132
Impulse extraction of oils	5	6.133
Spontaneous heating in fish meal	9	6.132
Fish meal from fresh-water fish	19	6.132
Fractional distillation of fatty acids	27	6.137
Solvent fractionation of animal fats	27	6.137
Fish meal	29	6.190

Subject	Page No.	Card No.
Fishery biology and fish culture		
Underwater camera	11	2.116
Oyster culture	23	1.81
Early life histories of pelagic species	29	9.12
Treatment of red tide	29	9.15
Fishing methods		
Ice fishing on the Great Lakes	13	2.14
Fish attraction with lights	25	2.14
Food technology		
Fisheries technological investigations	21	0.6
Methods of food analysis	21	0.6
Freshness of fish		
Variations in pH of albacore muscle	23	2.02
Rigor and adenosine triphosphate	23	2.02
Proteolytic enzyme activity in skipjack caeca	25	2.03
Frozen fish, general		
Fisheries technological investigations	21	0.6
Aerated concrete insulation	27	3.231
Frozen fish, changes in during freezing and cold storage		
Freezing of rock lobsters	1	3.238
Cold storage life of rockfish	1	3.249
Transport and storage of perishables	17	3.26
Fat composition and storage life	27	3.249
Frozen fish, packaging		
Freezing of rock lobsters	1	3.238
Frozen fish, processing		
New liquid freezing medium for round fish	17	3.234
Gear, fishing		
Mid-water trawl	11	2.1121
Knotless nets	25	2.111
Care of trawling lines	25	2.1121
Electric fishing device	25	2.14
Handling fresh fish		
Cooling fish aboard the vessel	25	2.114
Refrigerated display cabinet	25	2.6
Herring		
British Columbia eulachon fishery	15	1.2
Lobsters		
Freezing of rock lobsters	1	3.238
Canning rock lobsters	1	3.33
Mackerel		
California Jack mackerel fishery	23	1.1
Marine plant products		
Manufacture of crude agar	29	6.3
North America, Canadian fisheries		
British Columbia eulachon fishery	15	1.2
Nutrition and medicine, general		
Synthetic amino acids in feeds	21	0.32
Nutritive value of proteins	21	0.7
Review of animal nutrition	21	0.7
Antibiotics in feeds	21	0.7
Nutritional value of fish and toxicity		
Pancreatic digestion of proteins	29	6.195
Oils, chemical and physical properties		
Saturated fatty acid from shark liver oil	3	4.15
Effect of radiation on fish oils	3	4.20
Evolution of animal fats	15	4.13
Fatty acid composition of fish oils	15	4.13
Drying oils	27	4.80
Properties of whale oils	29	8.7
Oils, nutrition		
Evolution of animal fats	15	4.13
Synthetic C^{14} "squalene"	21	0.31
Oils, utilization and marketing		
Fatty acid composition of fish oils	15	4.13
Drying oils	27	4.80

United States
Department of the Interior
Fish and Wildlife Service
Washington 25, D. C.

Official Business
Permit No. 1015
Form EDS - 4/53 - 1500

Penalty for private use to avoid
payment of postage $300

Library,
Fish & Wildlife Service, POFI
P. O. Box 3830
Honolulu, Hawaii

128 S